NOISE AND VIBRATION IMPACT ANALYSIS

CYPRESS GROVE RESIDENTIAL PROJECT

CITY OF TUSTIN, CALIFORNIA

LSA

July 2025

NOISE AND VIBRATION IMPACT ANALYSIS

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CITY OF TUSTIN, CALIFORNIA

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TABLE OF CONTENTS

TABLE OF CONTENTS i
LIST OF ABBREVIATIONS AND ACRONYMS iii
INTRODUCTION 1
Project Location and Description 1
Existing Land Uses in the Project Area 2
NOISE AND VIBRATION FUNDAMENTALS 5
Characteristics of Sound 5
Measurement of Sound 5
Physiological Effects of Noise 6
Fundamentals of Vibration 8
REGULATORY SETTING 10
Applicable Noise Standards 10
California Code of Regulations 10
City of Tustin 10
Federal Transit Administration 12
Applicable Vibration Standards 12
California Department of Transportation 12
OVERVIEW OF THE EXISTING NOISE ENVIRONMENT 14
Ambient Noise Measurements 14
Existing Aircraft Noise 14
PROJECT IMPACTS 16
Short-Term Construction Noise Impacts 16
Short-Term Construction Vibration Impacts 19
Long-Term Off-Site Traffic Noise Impacts 21
Long-Term Stationary Noise Impacts 21
Long-Term Traffic-Related Vibration Impacts 22
LAND USE COMPATIBILITY 24
Exterior Noise Assessment 24
Interior Noise Assessment 24
BEST CONSTRUCTION PRACTICES AND DESIGN REQUIREMENTS 26
REFERENCES 27

APPENDICES

A: Noise Monitoring Sheets
B: Construction Noise Level Calculations
C: FHWA Traffic Noise Model Printouts
D: INSUL Noise Model Printouts

FIGURES AND TABLES

FIGURES

Figure 1: Project Location 3
Figure 2: Project Site 4
Figure 3: Noise Monitoring Locations 15

TABLES

Table A: Definitions of Acoustical Terms 7
Table B: Common Sound Levels and Their Noise Sources 8
Table C: City of Tustin Interior and Exterior Noise Standards 10
Table D: City of Tustin Maximum Noise Level Standards 12
Table E: Detailed Assessment Daytime Construction Noise Criteria 12
Table F: Interpretation of Vibration Criteria for Detailed Analysis 13
Table G: Construction Vibration Damage Criteria 13
Table H: Long-Term 24-Hour Ambient Noise Monitoring Results 14
Table I: Typical Construction Equipment Noise Levels 17
Table J: Potential Construction Noise Impacts at Nearest Receptor 18
Table K: Vibration Source Amplitudes for Construction Equipment 19
Table L: Potential Construction Vibration Annoyance Impacts at Nearest Receptor 20
Table M: Potential Construction Vibration Damage Impacts at Nearest Receptor 20
Table N: Traffic Noise Levels Without and With Proposed Project 23

LIST OF ABBREVIATIONS AND ACRONYMS

APN	Assessor's Parcel Number
Caltrans	California Department of Transportation
Caltrans Manual	Caltrans' *Transportation and Construction Vibration Guidance Manual*
City	City of Tustin
CNEL	Community Noise Equivalent Level
County	County of Orange
dB	decibel
dBA	A-weighted decibel
du/ac	dwelling units per acre
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
FTA Manual	FTA's *Transit Noise and Vibration Impact Assessment Manual*
HVAC	heating, ventilation, and air conditioning
in/sec	inches per second
JWA	John Wayne Airport
L_{dn}	day-night average noise level
L_{eq}	equivalent continuous sound level
L_{max}	maximum instantaneous sound level
PPV	peak particle velocity
project	Cypress Grove Residential Project
RMS	root-mean-square
STC	Sound Transmission Class
TMC	Tustin Municipal Code
VdB	vibration velocity in decibels

INTRODUCTION

This noise and vibration impact analysis has been prepared to evaluate the potential noise and vibration impacts and reduction measures associated with the Cypress Grove Residential Project (project) in Tustin, California. This report is intended to satisfy the City of Tustin (City) requirements for a project-specific noise impact analysis by examining the impacts of the project site and evaluating noise reduction measures that the project may require.

PROJECT LOCATION AND DESCRIPTION

The project site is located in the northeastern portion of the City of Tustin, bordered to the west by Prospect Avenue, to the north by 17th Street, to the east by Howland Way, and to the south by Arbolada Way. The project site, located at 17852 17th Street in Tustin, spans 8.5 acres and consists of one parcel (Assessor's Parcel Number [APN] 407-401-17) with multiple addresses: 17772, 17862, 17822, 17782, and 17852 17th Street. The project location is shown in Figure 1.

The project site currently contains the "Tustin Financial Plaza," which is developed with five buildings that provide a total of 193,000 square feet of office use. The site is currently accessible via two driveways, one from Prospect Avenue (west) and one from 17th Street that aligns with the Prospect Avenue (east) intersection. The site contains ornamental landscaping within landscaped parking lot medians, around the central structure, and along the perimeter of the project site.

The project proposes the development of 145 for-sale residential units on 8.5 acres in the City of Tustin. The residential units would consist of 62 single-family cluster units and 83 townhome-style residential condominium units, which would result in an average net density of 17.06 dwelling units per acre (du/ac) across the project site. The project would also include construction of one driveway entrance from Prospect Avenue, an internal access drive, one recreational common space area for residential use, and additional stormwater and utility improvements to accommodate proposed residences. The project design concept is illustrated in Figure 2, Project Site.

Access to the site would be provided via a driveway on Prospect Avenue. The existing driveway on 17th Street would be closed off and no longer accessible. On-site drive aisles would provide residents and guests with access to visitor spaces and residential garages.

The project would include ornamental landscaping throughout and around the project site. Landscaped areas would entail both private and communal open spaces. Overall, the project would provide 46,131 square feet of common open space. A 0.19-acre recreational area would be provided near the center of the proposed residential community and would contain a walking path, seating areas, and a large grass lawn with ornamental vegetation. Additionally, private open space would include grass lawns, trees, and shrubs.

A 6-foot screening wall, with a 3 to 4-foot retaining wall, would be constructed along the east and south sides of the project site, between the proposed project and existing residences. Partial fenced walls would delineate the private outdoor patio spaces public areas.

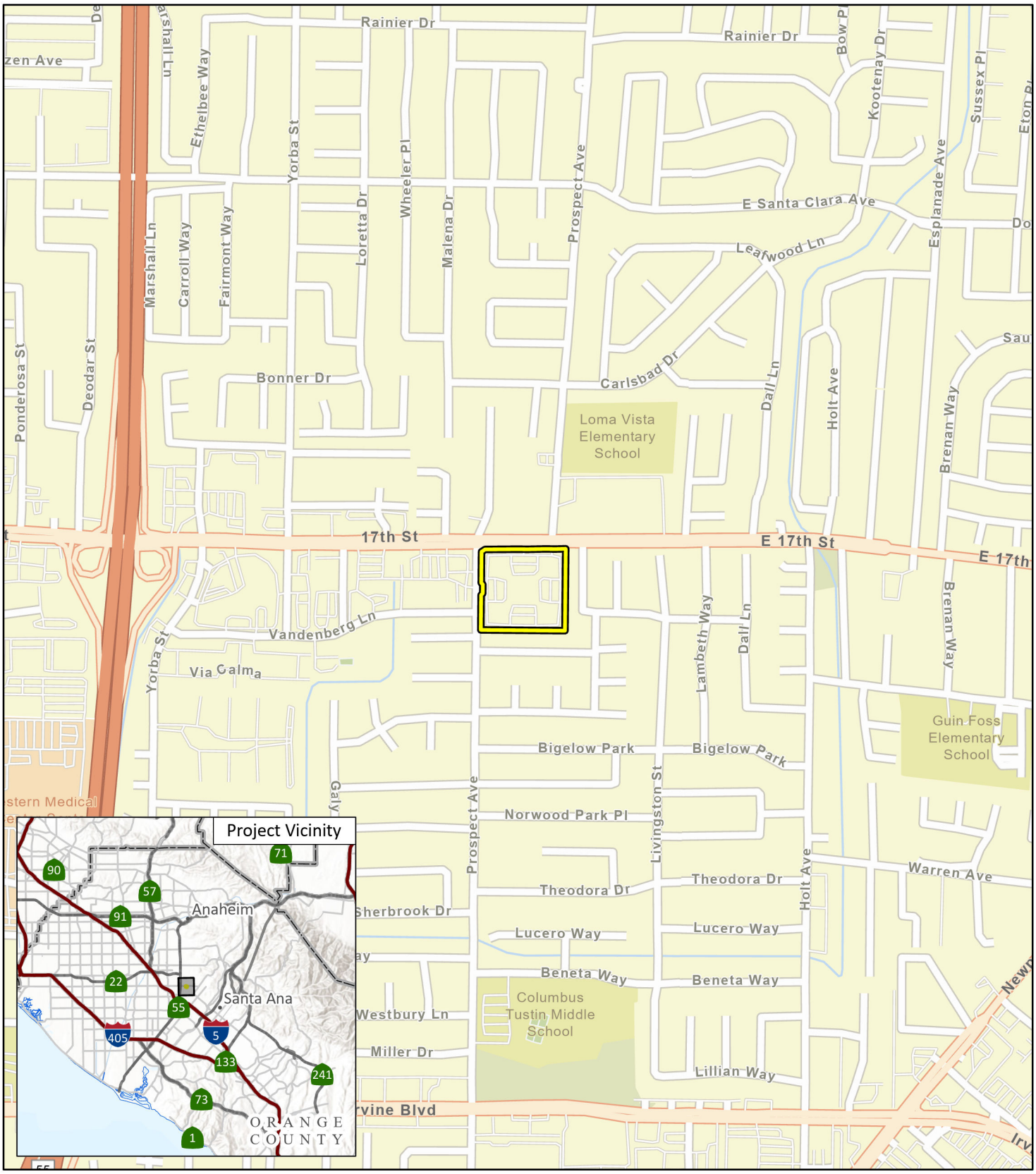
Construction activities for the proposed project would occur over one phase and would include demolition, site preparation, grading, building construction, paving, and architectural coating. Construction is expected to occur over an approximate duration of 15 months, beginning in June 2026 and commencing in September 2027. Construction would occur within the hours allowed by the City of Tustin Municipal Code Section 4614, which states that construction is prohibited between the hours of 6:00 p.m. and 7:00 a.m., Monday through Friday, and between 5:00 p.m. and 9:00 a.m. on Saturdays and during all hours Sundays and City-observed federal holidays.

EXISTING LAND USES IN THE PROJECT AREA

The project site is surrounded primarily by residential, commercial, and office uses. The areas adjacent to the project site include the following uses:

- **North:** Existing commercial and office uses opposite 17th Street
- **East:** Existing single-family residential uses
- **South:** Existing single-family residential uses
- **West:** Existing commercial and single-family residential uses opposite Prospect Avenue

The closest sensitive receptors to the project site are the single-family residential uses, located 5 feet south of the project's site boundary.



LSA

Project Location

FIGURE 1

N

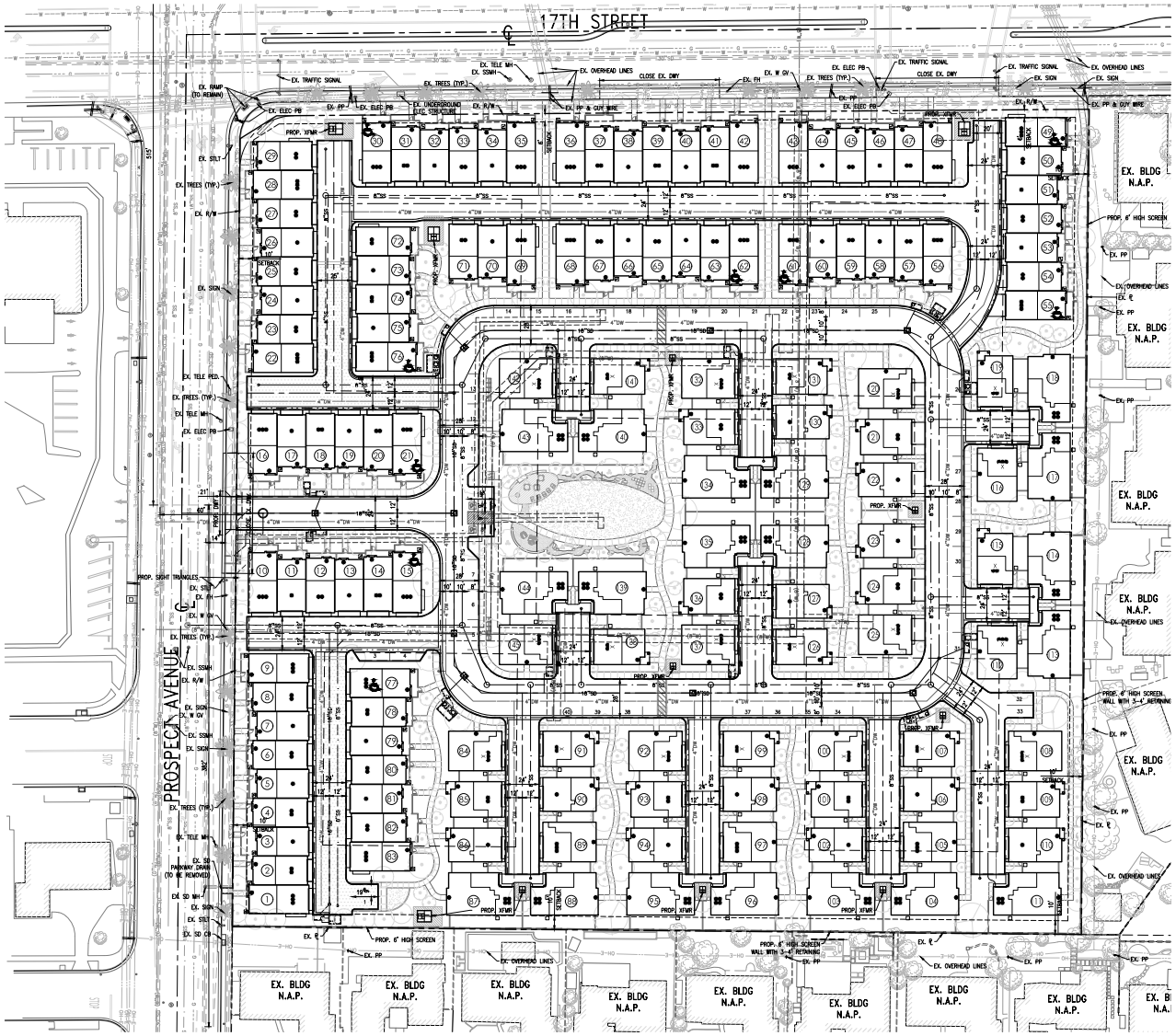
0 500 1000
FEET

SOURCE: Esri Streets (2025)

I:\E\ESL2201.104\GIS\Pro\Cypress Grove Residential Project\Cypress Grove Residential Project.aprx (5/19/2025)

Cypress Grove Residential Project

Project Location



LSA

FIGURE 2

0 60 120
FEET

Cypress Grove Residential Project

Project Site

SOURCE: C&V Consulting

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NOISE AND VIBRATION FUNDAMENTALS

CHARACTERISTICS OF SOUND

Noise is usually defined as unwanted sound. Noise consists of any sound that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, and sleep.

To the human ear, sound has two significant characteristics: pitch and loudness. Pitch is generally an annoyance, while loudness can affect the ability to hear. Pitch is the number of complete vibrations, or cycles per second, of a sound wave, which results in the tone's range from high to low. Loudness is the strength of a sound, and it describes a noisy or quiet environment; it is measured by the amplitude of the sound wave. Loudness is determined by the intensity of the sound waves combined with the reception characteristics of the human ear. Sound intensity is the average rate of sound energy transmitted through a unit area perpendicular to the direction in which the sound waves are traveling. This characteristic of sound can be precisely measured with instruments. The analysis of a project defines the noise environment of the project area in terms of sound intensity and its effect on adjacent sensitive land uses.

MEASUREMENT OF SOUND

Sound intensity is measured with the A-weighted decibel (dBA) scale to correct for the relative frequency response of the human ear. That is, an A-weighted noise level de-emphasizes low and very high frequencies of sound, similar to the human ear's de-emphasis of these frequencies. Decibels (dB), unlike the linear scale (e.g., inches or pounds), are measured on a logarithmic scale representing points on a sharply rising curve.

For example, 10 dB is 10 times more intense than 0 dB, 20 dB is 100 times more intense than 0 dB, and 30 dB is 1,000 times more intense than 0 dB. Thirty decibels (30 dB) represents 1,000 times as much acoustic energy as 0 dB. The decibel scale increases as the square of the change, representing the sound pressure energy. A sound as soft as human breathing is about 10 times greater than 0 dB. The decibel system of measuring sound gives a rough connection between the physical intensity of sound and its perceived loudness to the human ear. A 10 dB increase in sound level is perceived by the human ear as only a doubling of the sound's loudness. Ambient sounds generally range from 30 dB (very quiet) to 100 dB (very loud).

Sound levels are generated from a source, and their decibel level decreases as the distance from that source increases. Sound levels dissipate exponentially with distance from their noise sources. For a single point source, sound levels decrease approximately 6 dB for each doubling of distance from the source. This drop-off rate is appropriate for noise generated by stationary equipment. If noise is produced by a line source (e.g., highway traffic or railroad operations), the sound decreases 3 dB for each doubling of distance in a hard site environment. Line source sound levels decrease 4.5 dB for each doubling of distance in a relatively flat environment with absorptive vegetation.

There are many ways to rate noise for various time periods, but an appropriate rating of ambient noise affecting humans also accounts for the annoying effects of sound. The equivalent continuous

sound level (L_{eq}) is the total sound energy of time-varying noise over a sample period. However, the predominant rating scales for human communities in the State of California are the L_{eq} and Community Noise Equivalent Level (CNEL) or the day-night average noise level (L_{dn}) based on A-weighted decibels. CNEL is the time-weighted average noise over a 24-hour period, with a 5 dBA weighting factor applied to the hourly L_{eq} for noises occurring from 7:00 p.m. to 10:00 p.m. (defined as relaxation hours) and a 10 dBA weighting factor applied to noises occurring from 10:00 p.m. to 7:00 a.m. (defined as sleeping hours). L_{dn} is similar to the CNEL scale but without the adjustment for events occurring during the relaxation. CNEL and L_{dn} are within 1 dBA of each other and are normally interchangeable. The City of Tustin uses the CNEL noise scale for long-term traffic noise impact assessment.

Other noise rating scales of importance when assessing the annoyance factor include the maximum instantaneous noise level (L_{max}), which is the highest sound level that occurs during a stated time period. The noise environments discussed in this analysis for short-term noise impacts are specified in terms of maximum levels denoted by L_{max}, which reflects peak operating conditions and addresses the annoying aspects of intermittent noise. It is often used together with another noise scale, or noise standards in terms of percentile noise levels, in noise ordinances for enforcement purposes. For example, the L_{10} noise level represents the noise level exceeded 10 percent of the time during a stated period. The L_{50} noise level represents the median noise level. Half the time the noise level exceeds this level, and half the time it is less than this level. The L_{90} noise level represents the noise level exceeded 90 percent of the time and is considered the background noise level during a monitoring period. For a relatively constant noise source, the L_{eq} and L_{50} are approximately the same.

Noise impacts can be described in three categories. The first category includes audible impacts, which are increases in noise levels noticeable to humans. Audible increases in noise levels generally refer to a change of 3 dB or greater because this level has been found to be barely perceptible in exterior environments. The second category, potentially audible, refers to a change in the noise level between 1 dB and 3 dB. This range of noise levels has been found to be noticeable only in laboratory environments. The last category includes changes in noise levels of less than 1 dB, which are inaudible to the human ear. Only audible changes in existing ambient or background noise levels are considered potentially significant.

Physiological Effects of Noise

Physical damage to human hearing begins at prolonged exposure to sound levels higher than 85 dBA. Exposure to high sound levels affects the entire system, with prolonged sound exposure in excess of 75 dBA increasing body tensions, thereby affecting blood pressure and functions of the heart and the nervous system. In comparison, extended periods of sound exposure above 90 dBA would result in permanent cell damage. When the sound level reaches 120 dBA, a tickling sensation occurs in the human ear, even with short-term exposure. This level of sound is called the threshold of feeling. As the sound reaches 140 dBA, the tickling sensation is replaced by a feeling of pain in the ear (i.e., the threshold of pain). A sound level of 160–165 dBA will result in dizziness or a loss of equilibrium. The ambient or background noise problem is widespread and generally more concentrated in urban areas than in outlying, less developed areas.

Table A lists definitions of acoustical terms, and Table B shows common sound levels and their sources.

Table A: Definitions of Acoustical Terms

Term	Definitions
Decibel, dB	A unit of sound measurement that denotes the ratio between two quantities that are proportional to power; the number of decibels is 10 times the logarithm (to the base 10) of this ratio.
Frequency, Hz	Of a function periodic in time, the number of times that the quantity repeats itself in 1 second (i.e., the number of cycles per second).
A-Weighted Sound Level, dBA	The sound level obtained by use of A-weighting. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. (All sound levels in this report are A-weighted unless reported otherwise.)
L_{01}, L_{10}, L_{50}, L_{90}	The fast A-weighted noise levels that are equaled or exceeded by a fluctuating sound level 1%, 10%, 50%, and 90% of a stated time period, respectively.
Equivalent Continuous Noise Level, L_{eq}	The level of a steady sound that, in a stated time period and at a stated location, has the same A-weighted sound energy as the time-varying sound.
Community Noise Equivalent Level, CNEL	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 5 dBA to sound levels occurring in the evening from 7:00 p.m. to 10:00 p.m. and after the addition of 10 dBA to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
Day/Night Noise Level, L_{dn}	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 10 dBA to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
L_{max}, L_{min}	The maximum and minimum A-weighted sound levels measured on a sound level meter, during a designated time interval, using fast time averaging.
Ambient Noise Level	The all-encompassing noise associated with a given environment at a specified time. Usually a composite of sound from many sources from many directions, near and far; no particular sound is dominant.
Intrusive	The noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, time of occurrence, and tonal or informational content, as well as the prevailing ambient noise level.

Sources: (1) *Technical Noise Supplement* (Caltrans 2013); (2) *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).
Caltrans = California Department of Transportation
FTA = Federal Transit Administration

Table B: Common Sound Levels and Their Noise Sources

Noise Source	A-Weighted Sound Level in Decibels	Noise Environments	Subjective Evaluations
Near Jet Engine	140	Deafening	128 times as loud
Civil Defense Siren	130	Threshold of Pain	64 times as loud
Hard Rock Band	120	Threshold of Feeling	32 times as loud
Accelerating Motorcycle at a Few Feet Away	110	Very Loud	16 times as loud
Pile Driver; Noisy Urban Street/Heavy City Traffic	100	Very Loud	8 times as loud
Ambulance Siren; Food Blender	95	Very Loud	—
Garbage Disposal	90	Very Loud	4 times as loud
Freight Cars; Living Room Music	85	Loud	—
Pneumatic Drill; Vacuum Cleaner	80	Loud	2 times as loud
Busy Restaurant	75	Moderately Loud	—
Near Freeway Auto Traffic	70	Moderately Loud	Reference level
Average Office	60	Quiet	One-half as loud
Suburban Street	55	Quiet	—
Light Traffic; Soft Radio Music in Apartment	50	Quiet	One-quarter as loud
Large Transformer	45	Quiet	—
Average Residence without Stereo Playing	40	Faint	One-eighth as loud
Soft Whisper	30	Faint	—
Rustling Leaves	20	Very Faint	—
Human Breathing	10	Very Faint	Threshold of Hearing
—	0	Very Faint	—

Source: Compiled by LSA (2022).

FUNDAMENTALS OF VIBRATION

Vibration refers to ground-borne noise and perceptible motion. Ground-borne vibration is almost exclusively a concern inside buildings and is rarely perceived as a problem outdoors, where the motion may not be discernible, but without the effects associated with the shaking of a building there is less adverse reaction. Vibration energy propagates from a source through intervening soil and rock layers to the foundations of nearby buildings. The vibration then propagates from the foundation throughout the remainder of the structure. Building vibration may be perceived by occupants as the motion of building surfaces, the rattling of items sitting on shelves or hanging on walls, or a low-frequency rumbling noise. The rumbling noise is caused by the vibration of walls, floors, and ceilings that radiate sound waves. Annoyance from vibration often occurs when the vibration exceeds the threshold of perception by 10 dB or less. This is an order of magnitude below the damage threshold for normal buildings.

Typical sources of ground-borne vibration are construction activities (e.g., blasting, pile-driving, and operating heavy-duty earthmoving equipment), steel-wheeled trains, and occasional traffic on rough roads. Problems with both ground-borne vibration and noise from these sources are usually localized to areas within approximately 100 feet from the vibration source, although there are examples of ground-borne vibration causing interference out to distances greater than 200 ft (FTA 2018). When roadways are smooth, vibration from traffic, even heavy trucks, is rarely perceptible. It is assumed for most projects that the roadway surface will be smooth enough that ground-borne vibration from

street traffic would not exceed the impact criteria; however, construction of the project could result in ground-borne vibration that may be perceptible and annoying.

Ground-borne noise is not likely to be a problem because noise arriving via the normal airborne path will usually be greater than ground-borne noise.

Ground-borne vibration has the potential to disturb people and damage buildings. Although it is very rare for train-induced ground-borne vibration to cause even cosmetic building damage, it is not uncommon for construction processes such as blasting and pile-driving to cause vibration of sufficient amplitudes to damage nearby buildings (FTA 2018). Ground-borne vibration is usually measured in terms of vibration velocity, either the root-mean-square (RMS) velocity or peak particle velocity (PPV). The RMS is best for characterizing human response to building vibration, and PPV is used to characterize the potential for damage. Decibel notation acts to compress the range of numbers required to describe vibration. Vibration velocity level in decibels is defined as

$$L_v = 20 \log_{10} [V/V_{ref}]$$

where "L_v" is the vibration velocity in decibels (VdB), "V" is the RMS velocity amplitude, and "V_{ref}" is the reference velocity amplitude, or 1×10^{-6} inches per second (in/sec) used in the United States.

REGULATORY SETTING

APPLICABLE NOISE STANDARDS

The applicable noise standards governing the project site include the criteria in the City's Noise Element of the General Plan (Noise Element) and Section 8.24 of the City of Tustin Municipal Code (TMC).

California Code of Regulations

Interior noise levels for residential habitable rooms are regulated by Title 24 of the California Code of Regulations California Noise Insulation Standards. Title 24, Chapter 12, Section 1206.4, of the 2019 California Building Code requires that interior noise levels attributable to exterior sources not exceed 45 CNEL in any habitable room. A habitable room is a room used for living, sleeping, eating, or cooking. Bathrooms, closets, hallways, utility spaces, and similar areas are not considered habitable rooms for this regulation (Title 24 California Code of Regulations, Chapter 12, Section 1206.4).

City of Tustin

Noise Element of the General Plan

The City's General Plan Noise Element (City of Tustin 2012) has established exterior and interior noise standards as shown in Table C. These noise standards apply to approved land uses for which mitigation may be required to achieve the City's noise standards. As shown in Table C, the City has a noise standard of 65 dBA CNEL for exterior habitable areas and a 45 dBA CNEL noise standard for interior habitable areas for residential land uses.

Table C: City of Tustin Interior and Exterior Noise Standards

Land Use	Noise Standards[1]	
	Interior[2,3]	Exterior
Residential: Single-family, multifamily, duplex, mobile home	45 dBA CNEL	65 dBA CNEL[4]
Residential: Transient lodging, hotels, motels, nursing homes, hospitals	45 dBA CNEL	65 dBA CNEL[4]
Private offices, church sanctuaries, libraries, board rooms, conference rooms, theaters, auditoriums, concert halls, meeting rooms, etc.	45 dBA L_{eq} (12)	--
Schools	45 dBA L_{eq} (12)	67 dBA L_{eq} (12)[5]
General offices, reception, clerical, etc.	50 dBA L_{eq} (12)	-
Bank lobby, retail store, restaurant, typing pool, etc.	55 dBA L_{eq} (12)	-
Manufacturing, kitchen, warehousing, etc.	65 dBA L_{eq} (12)	-
Parks, playgrounds	-	65 dBA CNEL[5]
Golf courses, outdoor spectator sports, amusement parks	-	70 dBA CNEL

Source: Noise Element, Tustin General Plan (City of Tustin 2012).

1 CNEL: Community Noise Equivalent Level. L_{eq} (12): The A-weighted equivalent sound level averaged over a 12-hour period (usually the hours of operation).

2 Noise standard with windows closed. Mechanical ventilation shall be provided per UBC requirements to provide a habitable environment.

3 Indoor environment excluding bathrooms, toilets, closets, and corridors.

4 Outdoor environment limited to rear yard of single-family homes, multifamily patios, and balconies (with a depth of 6 feet or more) and common recreation areas.

5 Outdoor environment limited to playground areas, picnic areas, and other areas of frequent human use.

dBA = A-weighted decibels

UBC = Uniform Building Code

Municipal Code

Article 4, Chapter 6, of the City's Municipal Code establishes the maximum permissible noise level that may intrude into a neighbor's property. The Noise Ordinance establishes noise level standards for various land use categories affected by stationary noise sources. Land use categories in the City are defined by five noise zones, as listed below. Table D provides the City's maximum noise standard based on the noise zone, the location of the noise (exterior/interior), and the time period.

Noise Zone 1: All residential properties

Noise Zone 2: All commercial properties

Noise Zone 3: All industrial properties

Noise Zone 4: All special properties such as hospitals, convalescent homes, public and institutional schools, libraries, and churches

Noise Zone 5: All mixed-use properties

Article 4, Chapter 6, of the City's Municipal Code limits the erection, demolition, alteration, repair, excavation, grading, paving or construction of any building or site between the hours of 7:00 a.m. and 8:00 p.m. Monday through Friday and between 9:00 a.m. and 5:00 p.m. on Saturdays. Construction is prohibited on Sundays and City-observed federal holidays. Trucks, vehicles, and equipment that are making or are involved with material deliveries, loading or transfer of materials, equipment service, maintenance of any devices or appurtenances to any construction project in Tustin shall not be operated on or adjacent to said sites outside of the approved hours for construction activity.

In addition, construction activities may be permitted outside of those limitations in the case of urgent necessity or upon a finding that such approval would not adversely impact adjacent properties and the health, safety and welfare of the community if a temporary exception is granted in writing by the Building Official for private property or by the Director of Public Works for public properties or their authorized representatives. All temporary waiver requests shall be made in writing and shall include the specific times, dates, and locations requested and a description of the type of activity that is proposed. In granting a temporary exception, conditions may be imposed on construction activities to protect the health, safety, and welfare of the community. Any approval granted may be summarily revoked by the Building Official or Director of Public Works at the sole discretion of each official.

Table D: City of Tustin Maximum Noise Level Standards

Noise Zone	Exterior/ Interior	Time Period	L_{50} (30 mins)	L_{25} (15 mins)	L_8 (5 mins)	L_2 (1 min)	L_{max} (Anytime)
1	Exterior	7:00 AM to 10:00 PM	55	60	65	70	75
		10:00 PM to 7:00 AM	50	55	60	65	70
	Interior	7:00 AM to 10:00 PM	—	—	55	60	65
		10:00 PM to 7:00 AM	—	—	45	50	55
2	Exterior	Anytime	60	65	70	75	80
3	Exterior	Anytime	70	75	80	85	90
4	Exterior	Anytime	55	60	65	70	75
5	Exterior	Anytime	60	65	70	75	80

Source: Municipal Code (City of Tustin 2018).
Note: It shall be unlawful for any person at any location within the incorporated area of the City of Tustin to create any noise or to allow the creation of any noise on property owned, leased, occupied or otherwise controlled by such person, when the foregoing causes the noise level, when measured on any other property to exceed. In the event the alleged offensive noise consists of impact noise, simple tone, speech, music, or any combination thereof, each of the above noise levels shall be reduced by 5 dBA. In the event the ambient noise level exceeds any of the first four noise limit categories, the cumulate period applicable to said category shall be increased to reflect said ambient noise level. In the event the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under said category shall be increased to reflect the maximum ambient noise level.
dBA = A-weighted decibels
L_{max} = maximum instantaneous noise level
min/mins = minute/minutes

Federal Transit Administration

Although the City does not have construction noise level limits, construction noise was assessed using criteria from the Federal Transit Administration's (FTA) 2018 *Transit Noise and Vibration Impact Assessment Manual* (FTA Manual). Table E shows the FTA's Detailed Assessment Construction Noise Criteria based on the composite noise levels per construction phase.

Table E: Detailed Assessment Daytime Construction Noise Criteria

Land Use	Daytime 8-hour L_{eq} (dBA)
Residential	80
Commercial	85
Industrial	90

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).
dBA = A-weighted decibels
FTA = Federal Transit Administration
L_{eq} = equivalent continuous sound level

APPLICABLE VIBRATION STANDARDS

California Department of Transportation

Vibration standards included in the California Department of Transportation (Caltrans) *Transportation and Construction Vibration Guidance Manual* (Caltrans 2020) (Caltrans Manual) are used in this analysis for ground-borne vibration impacts on human annoyance and building damage.

The criteria for environmental impact from ground-borne vibration are based on the maximum levels for a single event and the RMS vibration level. Table F provides the criteria for assessing the potential for interference or annoyance from vibration levels in a building.

Table F: Interpretation of Vibration Criteria for Detailed Analysis

Human Response	Vibration Level (RMS in/sec)
Barely perceptible	0.01
Distinctly perceptible	0.04
Strongly perceptible	0.10
Severe	0.40

Source: *Transportation and Construction Vibration Guidance Manual* (Caltrans 2020).
Caltrans = California Department of Transportation
in/sec = inches per second RMS = root-mean-square

Table G lists the potential vibration building damage criteria associated with construction activities, as suggested in the Caltrans Manual (Caltrans 2020). Caltrans' guidelines show that a vibration level of up to 0.3 in/sec in PPV is considered safe for older residential structures and a vibration level of up to 0.5 in/sec in PPV is considered safe for newer residential structures and modern industrial or commercial buildings and would not result in any construction vibration damage.

Table G: Construction Vibration Damage Criteria

Structure / Condition	PPV (in/sec)
Extremely fragile historic buildings, ruins, ancient monuments	0.08
Fragile buildings	0.10
Historic and some old buildings	0.25
Older residential structures	0.30
New residential structures	0.50
Modern industrial / commercial buildings	0.50

Source: Table 19, *Transportation and Construction Vibration Guidance Manual* (Caltrans 2020).
Caltrans = California Department of Transportation
in/sec = inches per second
PPV = peak particle velocity

OVERVIEW OF THE EXISTING NOISE ENVIRONMENT

The primary existing noise sources in the project area are transportation facilities such as 17th Street and Prospect Avenue. Secondary noise sources include commercial uses to the west across Prospect Avenue.

AMBIENT NOISE MEASUREMENTS

Long-Term Noise Measurements

Long-term (24-hour) noise level measurements were conducted on February 25 and 26, 2025, using two (2) Larson Davis Spark 706RC Dosimeters. Table H provides a summary of the measured hourly noise levels and calculated CNEL level from the long-term noise level measurements. As shown in Table H, the calculated CNEL levels range from 67.4 dBA CNEL to 70.2 dBA CNEL. Hourly noise levels at surrounding sensitive uses are as low as 47.7 dBA L_{eq} during nighttime hours and 49.0 dBA L_{eq} during daytime hours. Long-term noise monitoring survey sheets are provided in Appendix A. Figure 3 shows the long-term monitoring locations.

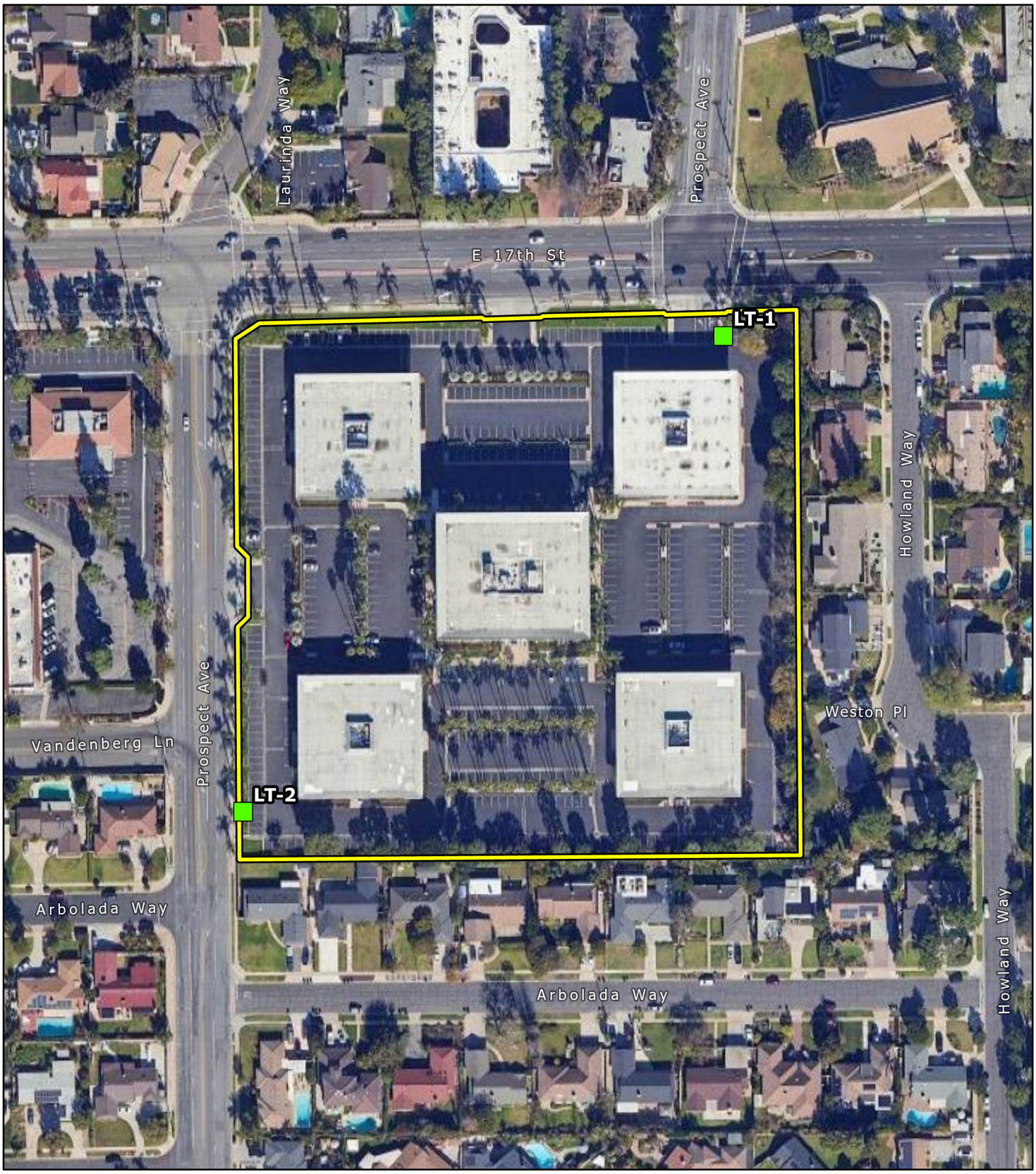
Table H: Long-Term 24-Hour Ambient Noise Monitoring Results

Location		Daytime Noise Levels[1] (dBA L_{eq})	Evening Noise Levels[2] (dBA L_{eq})	Nighttime Noise Levels[3] (dBA L_{eq})	Daily Noise Levels (dBA CNEL)
LT-1	17862 17th Street, on a palm tree near the northeast corner of the project site, approximately 85 feet away from the 17th Street centerline.	67.4-72.7	66.3-66.9	49.0-66.0	70.2
LT-2	17782 17th Street, on a palm tree near the southwest corner of the project site, approximately 40 feet away from the Prospect Avenue centerline.	64.8-72.0	61.0-64.3	47.7-63.0	67.4

Source: Compiled by LSA (2025).
Note: Noise measurements were conducted from February 25 and 26, 2025, starting at 10:00 a.m.
[1] Daytime Noise Levels = noise levels during the hours from 7:00 a.m. to 7:00 p.m.
[2] Evening Noise Levels = noise levels during the hours from 7:00 p.m. to 10:00 p.m.
[3] Nighttime Noise Levels = noise levels during the hours from 10:00 p.m. to 7:00 a.m.
dBA = A-weighted decibels
CNEL = Community Noise Equivalent Level
L_{eq} = equivalent continuous sound level

EXISTING AIRCRAFT NOISE

Aircraft flyovers may be audible on the project site due to aircraft activity in the vicinity of the project site. The nearest airport to the project is John Wayne Airport (JWA), a commercial airport approximately 6 miles to the south. The project site is located outside the 60 dBA CNEL noise contour of JWA based on the JWA Airport 2022 Annual Community Noise Equivalent Level Contours (John Wayne Airport 2022). Additionally, there are no helipads or private airstrips within 2 miles of the project area. Due to the distance of the project site from the nearest airport, impacts related to aircraft operations are not further discussed in this analysis.



LSA

Project Location

Noise Monitoring Locations

FIGURE 3

N

0 75 150

FEET

SOURCE: Google Maps (2024)

Cypress Grove Residential Project

Noise Monitoring Locations

I:\E\ESL2201.104\GIS\Pro\Cypress Grove Residential Project\Cypress Grove Residential Project.aprx (5/19/2025)

PROJECT IMPACTS

SHORT-TERM CONSTRUCTION NOISE IMPACTS

Two types of short-term noise impacts could occur during the construction of the proposed project. First, construction crew commutes and the transport of construction equipment and materials to the site for the proposed project would incrementally increase noise levels on access roads leading to the site. The effect on longer-term ambient noise levels would be small when compared to existing daily traffic volumes on 17th Street. Based on the *Traffic Impact Analysis for the Proposed Cypress Grove Residential Project* (EPD Solutions, Inc. 2025), the existing traffic on 17th Street within the vicinity of the project site is approximately 24,010. During the demolition phase, approximately 11,950 acoustically equivalent trips would occur during an average day from worker and delivery activities resulting in a traffic noise increase of approximately 1.8 dBA, as shown in Appendix B. A noise level increase of less than 3 dBA would not be perceptible to the human ear in an outdoor environment. Therefore, short-term, construction-related impacts associated with worker commute and equipment transport to the project site would be less than significant.

The second type of short-term noise impact is related to noise generated during demolition, site preparation, grading, building construction, paving, and architectural coating on the project site. Construction is completed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated on the site and, therefore, the noise levels surrounding the site as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. Table I lists typical construction equipment noise levels recommended for noise impact assessments, based on a distance of 50 feet between the equipment and a noise receptor, taken from the FHWA *Roadway Construction Noise Model* (FHWA 2006).

In addition to the reference maximum noise level, the usage factor provided in Table I is used to calculate the hourly noise level impact for each piece of equipment based on the following equation:

$$L_{eq}(equip) = E.L. + 10\log(U.F.) - 20\log\left(\frac{D}{50}\right)$$

where: $L_{eq}(equip)$ = L_{eq} at a receiver resulting from the operation of a single piece of equipment over a specified time period.

E.L. = noise emission level of the particular piece of equipment at a reference distance of 50 feet.

U.F. = usage factor that accounts for the fraction of time that the equipment is in use over the specified period of time.

D = distance from the receiver to the piece of equipment.

Table I: Typical Construction Equipment Noise Levels

Equipment Description	Acoustical Usage Factor (%)[1]	Maximum Noise Level (L_{max}) at 50 Feet[2]
Auger Drill Rig	20	84
Backhoes	40	80
Compactor (ground)	20	80
Compressor	40	80
Cranes	16	85
Dozers	40	85
Dump Trucks	40	84
Excavators	40	85
Flat Bed Trucks	40	84
Forklift	20	85
Front-end Loaders	40	80
Graders	40	85
Impact Pile Drivers	20	95
Jackhammers	20	85
Paver	50	77
Pickup Truck	40	55
Pneumatic Tools	50	85
Pumps	50	77
Rock Drills	20	85
Rollers	20	85
Scrapers	40	85
Tractors	40	84
Trencher	50	80
Welder	40	73

Source: *FHWA Roadway Construction Noise Model User's Guide*, Table 1 (FHWA 2006).
Note: Noise levels reported in this table are rounded to the nearest whole number.
[1] Usage factor is the percentage of time during a construction noise operation that a piece of construction equipment is operating at full power.
[2] Maximum noise levels were developed based on Specification 721.560 from the Central Artery/Tunnel program to be consistent with the City of Boston's Noise Code for the "Big Dig" project.
FHWA = Federal Highway Administration
L_{max} = maximum instantaneous sound level

Each piece of construction equipment operates as an individual point source. Using the following equation, a composite noise level can be calculated when multiple sources of noise operate simultaneously:

$$Leq\ (composite) = 10 * \log_{10}\left(\sum_{1}^{n} 10^{\frac{Ln}{10}}\right)$$

Using the equations from the methodology above, the reference information in Table I, and the construction equipment list provided, the composite noise level of each construction phase was calculated. The project construction composite noise levels at a distance of 50 feet would range from 74 dBA L_{eq} to 89 dBA L_{eq} with the highest noise levels occurring during the site preparation phase.

Once composite noise levels are calculated, reference noise levels can then be adjusted for distance using the following equation:

$$Leq\ (at\ distance\ X) = Leq\ (at\ 50\ feet) - 20 * \log_{10}\left(\frac{X}{50}\right)$$

In general, this equation shows that doubling the distance would decrease noise levels by 6 dBA while halving the distance would increase noise levels by 6 dBA.

Table J shows the nearest sensitive uses to the project site, their distance from the center of construction activities, and composite noise levels expected during construction. These noise level projections do not consider intervening topography or barriers. Construction equipment calculations are provided in Appendix B.

Table J: Potential Construction Noise Impacts at Nearest Receptor

Receptor (Location)	Composite Noise Level (dBA L_{eq}) at 50 ft[1]	Distance (ft)	Composite Noise Level (dBA L_{eq})
Residential (South)	89	330	72
Residential (East)		330	72
Residential and Commercial (West)		450	70
Residential and Commercial (North)		450	70

Source: Compiled by LSA (2025).

[1] The composite construction noise level represents the site preparation phase which is expected to result in the greatest noise level as compared to other phases.

dBA L_{eq} = average A-weighted hourly noise level

ft = foot/feet

While construction noise will vary, it is expected that composite noise levels during construction at the nearest off-site sensitive uses to the south and east would reach 72 dBA L_{eq}. These predicted noise levels would only occur when all construction equipment is operating simultaneously; and therefore, are assumed to be rather conservative in nature. While construction-related short-term noise levels have the potential to be higher than existing ambient noise levels in the project area under existing conditions, the noise impacts would no longer occur once project construction is completed.

As stated above, noise impacts associated with construction activities are regulated by the City's noise ordinance. The proposed project will be required to comply with the construction hours specified in the City's Noise Ordinance, which states that construction activities are allowed between 7:00 a.m. and 8:00 p.m., Monday through Friday, and between 9:00 a.m. and 5:00 p.m. on Saturdays. Construction is prohibited on Sundays and City-observed federal holidays.

As it relates to off-site uses, construction-related noise impacts would remain below the 80 dBA L_{eq} and 85 dBA L_{eq} construction noise level criteria as established by the FTA for residential and commercial land uses, respectively, for the average daily conditions as modeled from the center of the project site, and therefore, they would be considered less than significant. Best construction

practices presented at the end of this analysis shall be implemented to minimize noise impacts to surrounding receptors.

SHORT-TERM CONSTRUCTION VIBRATION IMPACTS

This construction vibration impact analysis discusses the level of human annoyance using vibration levels in RMS in/sec and assesses the potential for building damages using vibration levels in PPV in/sec. This is because vibration levels calculated in RMS are best for characterizing human response to building vibration, while vibration level in PPV is best for characterizing potential for damage.

Table K shows the PPV and RMS PPV values at 25 feet from the construction vibration source. As shown in Table K, bulldozers and other heavy-tracked construction equipment (expected to be used for this project) generate approximately 0.089 in/sec PPV or 0.062 RMS in/sec of ground-borne vibration when measured at 25 feet, based on the Caltrans Manual. The distance to the nearest buildings for vibration impact analysis is measured between the nearest off-site buildings and the project construction boundary (assuming the construction equipment would be used at or near the project setback line).

Table K: Vibration Source Amplitudes for Construction Equipment

Equipment	Reference PPV/L_V at 25 ft	
	PPV (in/sec)	RMS (in/sec)[1]
Hoe Ram	0.089	0.062
Large Bulldozer[2]	**0.089**	**0.062**
Caisson Drilling	0.089	0.062
Loaded Trucks[2]	**0.076**	**0.053**
Jackhammer	0.035	0.025
Small Bulldozer	0.003	0.002

Source: *Transportation and Construction Vibration Guidance Manual* (Caltrans 2020).
[1] RMS vibration velocity is 70 percent of maximum PPV.
[2] Equipment shown in **bold** is expected to be used on site.
Caltrans = California Department of Transportation
ft = foot/feet
in/sec = inches per second
PPV = peak particle velocity
RMS = root-mean-square

The formula for vibration transmission is provided below, and Tables L and M below provide a summary of off-site construction vibration levels. The material dampening coefficient, 'n', ranges between 1.1 and 1.5 depending on soil type and distance from equipment.

$$PPV_{equip} = PPV_{ref} \times (25/D)^n$$

Table L: Potential Construction Vibration Annoyance Impacts at Nearest Receptor

Receptor (Location)	Reference Vibration Level (RMS in/sec) at 25 ft[1]	Distance (ft)[2]	Vibration Level (RMS in/sec)
Residential (South)	0.062	330	0.004
Residential (East)		330	0.004
Residential and Commercial (West)		450	0.003
Residential and Commercial (North)		450	0.003

Source: Compiled by LSA (2025).
[1] The reference vibration level is associated with a large bulldozer, which is expected to be representative of the heavy equipment used during construction.
[2] The assessment distance is associated with the average condition, identified by the distance from the center of construction activities to surrounding uses.
ft = foot/feet
in/sec = inches per second
RMS = Root-mean-square

Table M: Potential Construction Vibration Damage Impacts at Nearest Receptor

Receptor (Location)	Reference Vibration Level (PPV) at 25 ft[1]	Distance (ft)[2]	Vibration Level (PPV)
Residential (South)	0.089	10	0.244
Residential (East)		10	0.244
Residential (West)		90	0.022
Commercial (West)		115	0.017
Residential (North)		130	0.015
Commercial (North)		150	0.012

Source: Compiled by LSA (2025).
[1] The reference vibration level is associated with a large bulldozer, which is expected to be representative of the heavy equipment used during construction.
[2] The assessment distance is associated with the peak condition, identified by the distance from the perimeter of construction activities to surrounding structures.
ft = foot/feet
PPV = peak particle velocity

As previously shown in Table F, the threshold at which vibration levels would result in annoyance would be 0.04 in/sec RMS. Based on the information provided in Table L, vibration levels are expected to approach 0.004 in/sec RMS at the closest receptors and would not exceed the annoyance thresholds.

As discussed above, the standards indicate that the construction vibration damage criterion is 0.5 in/sec in PPV. Based on the information provided in Table M, the closest structures to external construction activities are the residential uses to the south and east. Using the reference data from Table K and the equation above, it is expected that vibration levels generated by dump trucks and other large equipment operating as close as 5 feet to the project boundary (10 feet from the closest structures) would generate ground-borne vibration levels of up to 0.244 PPV in/sec at the closest structures to the project site. This vibration level would not exceed the 0.3 in/sec PPV threshold

considered safe for older residential structures and the 0.5 in/sec PPV threshold for newer residential structures and modern industrial or commercial buildings, which would result in a less than significant impact. Vibration levels at all other buildings would be lower. Therefore, construction would not result in any vibration damage, and impacts would be less than significant.

LONG-TERM OFF-SITE TRAFFIC NOISE IMPACTS

The guidelines included in the FHWA Highway Traffic Noise Prediction Model (FHWA-RD-77 108) were used to evaluate highway traffic-related noise conditions along roadway segments in the project vicinity. This model requires various parameters, including traffic volumes, vehicle mix, vehicle speed, and roadway geometry to compute typical equivalent noise levels during daytime, evening, and nighttime hours. The resultant noise levels are weighted and summed over 24-hour periods to determine the CNEL values. Table N provides the traffic noise levels for the existing conditions and opening year and with and without project scenarios. These noise levels represent the worst-case scenario, which assumes no shielding is provided between the traffic and the location where the noise contours are drawn.

The without and with project scenario traffic volumes were obtained from the Traffic Impact Analysis (EPD Solutions, Inc. 2025). Appendix C provides the specific assumptions used in developing these noise levels and model printouts. Table N shows that the increase in project-related traffic noise would be no greater than 0.4 dBA for existing conditions, while for the opening year scenarios, the project-related traffic noise would decrease. Noise level increases less than 3 dBA are not perceptible to the human ear in an outdoor environment. Therefore, traffic noise impacts from project-related traffic on off-site sensitive receptors would be less than significant, and no mitigation measures are required.

LONG-TERM STATIONARY NOISE IMPACTS

Adjacent off-site land uses would be potentially exposed to stationary-source noise impacts from sources which include on-site heating, ventilation, and air conditioning (HVAC) equipment.

Heating, Ventilation, and Air Conditioning Equipment

The project would have HVAC units. The HVAC equipment could operate 24 hours per day. Based on previous measurements that LSA has conducted, the HVAC equipment would generate noise levels of 66.6 dBA L_{eq} at 5 feet per HVAC unit. The most conservative assessment of potential impact would be the residences to the east of proposed Units 49-55, located approximately 40 feet away from the closest HVAC unit. After distance attenuation, noise generated from on-site HVAC equipment 40 feet from the proposed buildings would potentially reach up to 48.5 dBA L_{eq}, which would not exceed the City's exterior daytime (7:00 a.m. to 10:00 p.m.) and nighttime (10:00 p.m. to 7:00 a.m.) noise standards of 55 dBA L_{eq} and 50 dBA L_{eq}, respectively, for residential uses. Therefore, noise associated with the on-site HVAC equipment would not exceed the City's noise standard and would be less than significant.

LONG-TERM TRAFFIC-RELATED VIBRATION IMPACTS

The proposed project would not generate vibration levels related to on-site operations. In addition, vibration levels generated from project-related traffic on the adjacent roadways are unusual for on-road vehicles because the rubber tires and suspension systems of on-road vehicles provide vibration isolation. Based on a reference vibration level of 0.076 in/sec PPV, structures greater than 20 feet from the roadways that contain project trips would experience vibration levels below the most conservative standard of 0.12 in/sec PPV; therefore, vibration levels generated from project-related traffic on the adjacent roadways would be less than significant, and no mitigation measures are required.

Table N: Traffic Noise Levels Without and With Proposed Project

Roadway Segment	Existing – Without Project		Existing – With Project			Opening Year – Without Project		Opening Year – With Project		
	ADT	CNEL (dBA) 50 ft from Centerline of Nearest Lane	ADT	CNEL (dBA) 50 ft from Centerline of Nearest Lane	Increase from Baseline Conditions (dBA)	ADT	CNEL (dBA) 50 ft from Centerline of Nearest Lane	ADT	CNEL (dBA) 50 ft from Centerline of Nearest Lane	Increase from Baseline Conditions (dBA)
17th Street West of Prospect Avenue	26,920	69.1	27,520	69.2	0.1	28,510	69.4	27,450	69.2	-0.2
17th Street East of Prospect Avenue	24,010	68.6	24,260	68.7	0.1	25,620	68.9	24,640	68.7	-0.2
Prospect Avenue North of 17th Street	8,980	64.6	9,030	64.6	0.0	9,780	65.0	9,670	64.9	-0.1
Prospect Avenue between 17th Street and Vandenberg Lane	9,130	64.4	9,980	64.8	0.4	10,270	64.9	10,000	64.8	-0.1
Prospect Avenue South of Vandenberg Lane	10,360	63.6	10,490	63.6	0.0	11,570	64.0	11,390	64.0	0.0
Vandenberg Lane West of Prospect Avenue	1,790	56.2	1,840	56.3	0.1	1,860	56.3	1,770	56.1	-0.2

Source: Compiled by LSA (2025).
Note: Shaded cells indicate roadway segments adjacent to the project site.
ADT = average daily traffic
CNEL= Community Noise Equivalent Level
dBA = A-weighted decibels
ft = foot/feet

LAND USE COMPATIBILITY

The dominant source of noise in the project vicinity is traffic noise from adjacent roadways including 17th Street and Prospect Avenue.

EXTERIOR NOISE ASSESSMENT

Based on the monitoring results shown in Table H, the existing measured noise level at the project site closest to 17th Street is 70.2 dBA CNEL. Exterior living areas of residential units, which are either shared spaces, access points to the units, or balconies that are less than 6 feet deep, are not considered as exterior living areas. The exterior decks at the proposed units are 5 feet deep and, therefore, exterior noise levels reduction measures are not required for the proposed project.

INTERIOR NOISE ASSESSMENT

The following presents results of on the on-site interior noise analysis at the proposed residential uses of the project. As discussed above, per the City's Noise Element, consistent with the California Code of Regulations, an interior noise level standard of 45 dBA CNEL or less is required for all noise-sensitive rooms. Based on the expected future exterior noise levels, at the northern façade of the buildings closest to 17th Street, noise levels would approach 71 dBA CNEL, and noise levels would approach 67 dBA CNEL along Prospect Avenue. With noise levels approaching 71 dBA CNEL, a minimum noise reduction of 26 dBA would be required.

Based on a review of the most recent *Cypress Grove Project Plans* (project plans) (Kevin L. Crook Architects Inc., May 2025), all residential units will have HVAC units allowing for a windows-closed condition.

In order to calculate the noise reduction provided by the proposed exterior wall assembly, the transmission loss at the octave band frequencies for wall material by type and windows is combined to provide an overall noise reduction. The rating of the wall and window, or windows within the assembly, will have a rating often referred to as a Sound Transmission Class or STC rating. INSUL, a software program for predicting interior noise environments from wall and roof construction and window selections, was used to assess typical exterior-to-interior noise level reductions from the preliminary details of the proposed project. The details provided in the project plans are as follows:

<u>Exterior Wall</u>

- 1-coat stucco system over building paper
- One layer of 5/8-inch Type "X" gypsum board
- 2-inch x 4-inch or 2-inch x 6-inch wood studs, 16 inches on center, filled with fiberglass insulation
- One layer of 5/8-inch Type "X" gypsum board

At this time, the window supplier has yet to be chosen; therefore, this analysis utilizes window data (Milgard Windows) gathered by LSA for comparison purposes. INSUL printouts are presented in Appendix D.

In order to determine if an interior noise levels of 45 dBA CNEL would be achieved, calculations were completed for each of the sensitive rooms within each unit type around the perimeter of the building in the project plans assuming the highest estimated outdoor noise levels of 71 dBA CNEL at exterior facades of units along the northern portion of the site. For the units along the western portion of the site, an exterior level of 67 dBA CNEL was assumed. The results of the analysis indicate that with windows and glass doors with a minimum STC of 31, for all sensitive rooms at units 29 through 49, would achieve interior noise levels below 45 dBA CNEL with windows closed. For units 1 through 10, 16, and 22 through 28, windows and glass doors with a minimum STC of 29 would be required. The rest of the units though out the project site would achieve the interior standard with standard windows having a minimum STC of 25.

BEST CONSTRUCTION PRACTICES AND DESIGN REQUIREMENTS

In addition to compliance with the City's Municipal Code allowed hours of construction of 7:00 a.m. to 8:00 p.m., Monday through Friday, and 9:00 a.m. to 5:00 p.m. on Saturdays and City-observed federal holidays, the following best construction practices would further minimize construction noise impacts:

- The project construction contractor shall equip all construction equipment, fixed or mobile, with properly operating and maintained noise mufflers consistent with manufacturer's standards.
- The project construction contractor shall locate staging areas away from off-site sensitive uses during the later phases of project development.
- The project construction contractor shall place all stationary construction equipment so that emitted noise is directed away from sensitive receptors nearest the project site whenever feasible.

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APPENDIX A

NOISE MONITORING SHEETS

Noise Measurement Survey – 24 HR

Project Number: ESL2201.104
Project Name: Cypress Grove

Test Personnel: Corey Knips
Equipment: LD Spark 706RC (SN: 18571)

Site Number: LT-1 Start Date: 2/25/2025

Time: From 10:00 a.m. To 10:00 a.m.

Site Location: 17862 17th Street, near the northeast corner of the project site, approximately 85 feet from the 17th Street centerline on a palm tree.

Primary Noise Sources: Traffic on 17th Street and Prospect Avenue, and light parking lot lot activity (including vehicles entering and exiting the driveway).

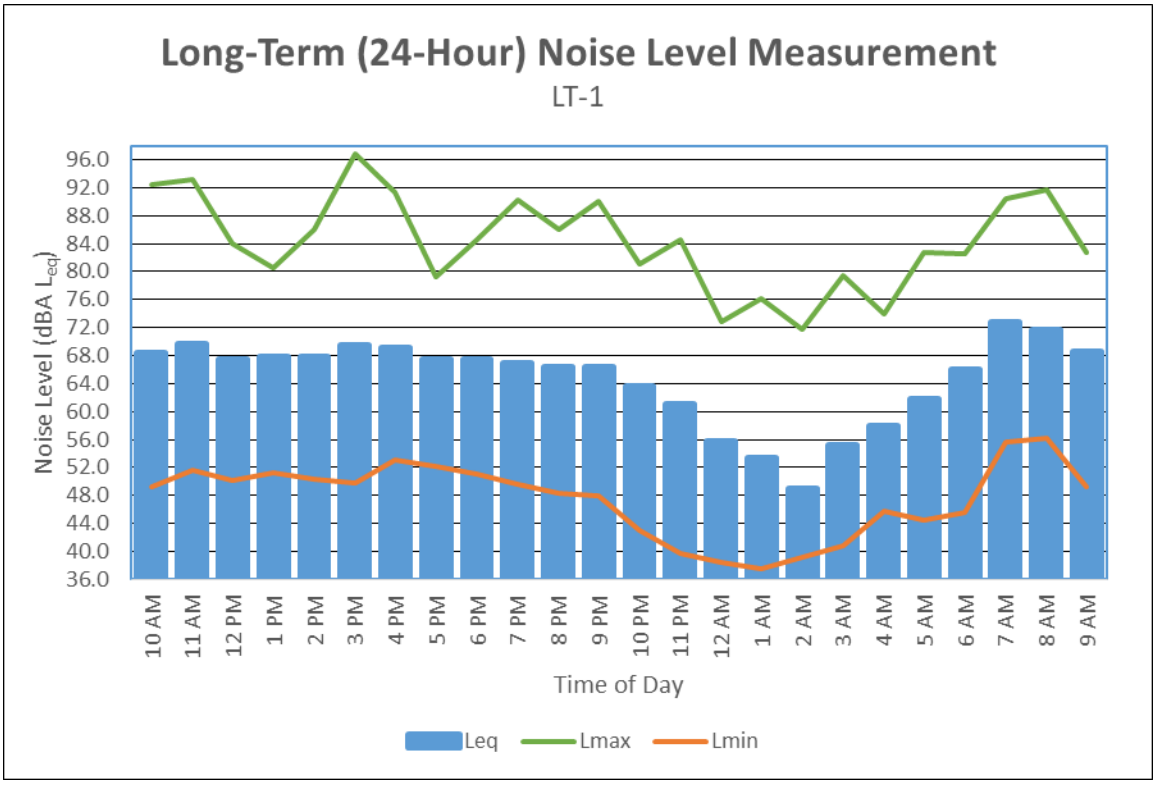
Comments:

Photo:

Long-Term (24-Hour) Noise Level Measurement Results at LT-1

Start Time	Date	Noise Level (dBA)		
		L_{eq}	L_{max}	L_{min}
10:00 AM	2/25/2025	68.4	92.4	49.3
11:00 AM	2/25/2025	69.7	93.1	51.6
12:00 PM	2/25/2025	67.4	84.1	50.1
1:00 PM	2/25/2025	67.9	80.5	51.2
2:00 PM	2/25/2025	67.8	86.0	50.3
3:00 PM	2/25/2025	69.4	96.9	49.8
4:00 PM	2/25/2025	69.1	91.3	53.0
5:00 PM	2/25/2025	67.4	79.2	52.2
6:00 PM	2/25/2025	67.5	84.5	51.0
7:00 PM	2/25/2025	66.9	90.3	49.6
8:00 PM	2/25/2025	66.3	86.0	48.4
9:00 PM	2/25/2025	66.3	90.0	48.0
10:00 PM	2/25/2025	63.7	81.0	43.1
11:00 PM	2/25/2025	61.0	84.5	39.7
12:00 AM	2/26/2025	55.8	72.8	38.5
1:00 AM	2/26/2025	53.3	76.1	37.5
2:00 AM	2/26/2025	49.0	71.8	39.2
3:00 AM	2/26/2025	55.3	79.5	40.9
4:00 AM	2/26/2025	58.0	74.0	45.7
5:00 AM	2/26/2025	61.8	82.7	44.4
6:00 AM	2/26/2025	66.0	82.6	45.6
7:00 AM	2/26/2025	72.7	90.5	55.7
8:00 AM	2/26/2025	71.6	91.7	56.2
9:00 AM	2/26/2025	68.5	82.7	49.3

Source: Compiled by LSA Associates, Inc. (2025).
dBA = A-weighted decibel
L_{eq} = equivalent continuous sound level
L_{max} = maximum instantaneous noise level
L_{min} = minimum measured sound level



Noise Measurement Survey – 24 HR

Project Number: ESL2201.104
Project Name: Cypress Grove

Test Personnel: Corey Knips
Equipment: LD Spark 706RC (SN: 18571)

Site Number: LT-2 Start Date: 2/25/2025

Time: From 10:00 a.m. To 10:00 a.m.

Site Location: 17782 17th Street, near the southwest corner of the project site, approximately 40 feet from the Prospect Avenue centerline on a palm tree.

Primary Noise Sources: Traffic on Prospect Avenue, faint traffic on 17th Street, and light parking lot activity.

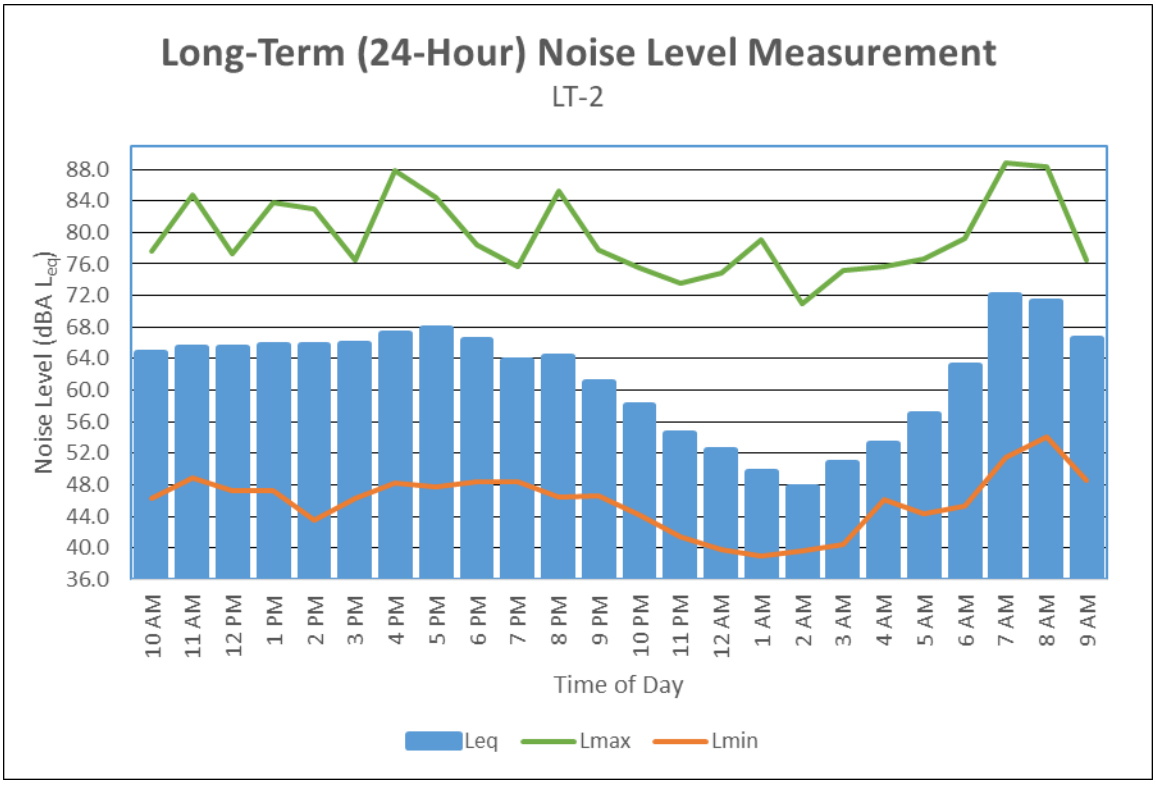
Comments:

Photo:

Long-Term (24-Hour) Noise Level Measurement Results at LT-2

Start Time	Date	Noise Level (dBA)		
		L_{eq}	L_{max}	L_{min}
2/25/25 10:00	10:00 AM	2/25/2025	64.8	77.6
2/25/25 11:00	11:00 AM	2/25/2025	65.3	84.7
2/25/25 12:00	12:00 PM	2/25/2025	65.4	77.3
2/25/25 13:00	1:00 PM	2/25/2025	65.7	83.8
2/25/25 14:00	2:00 PM	2/25/2025	65.7	83.0
2/25/25 15:00	3:00 PM	2/25/2025	65.8	76.5
2/25/25 16:00	4:00 PM	2/25/2025	67.2	87.8
2/25/25 17:00	5:00 PM	2/25/2025	67.7	84.5
2/25/25 18:00	6:00 PM	2/25/2025	66.3	78.4
2/25/25 19:00	7:00 PM	2/25/2025	63.8	75.7
2/25/25 20:00	8:00 PM	2/25/2025	64.3	85.2
2/25/25 21:00	9:00 PM	2/25/2025	61.0	77.8
2/25/25 22:00	10:00 PM	2/25/2025	58.0	75.5
2/25/25 23:00	11:00 PM	2/25/2025	54.4	73.5
2/26/25 0:00	12:00 AM	2/26/2025	52.4	74.8
2/26/25 1:00	1:00 AM	2/26/2025	49.6	79.0
2/26/25 2:00	2:00 AM	2/26/2025	47.7	71.0
2/26/25 3:00	3:00 AM	2/26/2025	50.7	75.2
2/26/25 4:00	4:00 AM	2/26/2025	53.2	75.7
2/26/25 5:00	5:00 AM	2/26/2025	56.9	76.6
2/26/25 6:00	6:00 AM	2/26/2025	63.0	79.3
2/26/25 7:00	7:00 AM	2/26/2025	72.0	88.9
2/26/25 8:00	8:00 AM	2/26/2025	71.1	88.3
2/26/25 9:00	9:00 AM	2/26/2025	66.5	76.5

Source: Compiled by LSA Associates, Inc. (2025).
dBA = A-weighted decibel
L_{eq} = equivalent continuous sound level
L_{max} = maximum instantaneous noise level
L_{min} = minimum measured sound level



APPENDIX B

CONSTRUCTION NOISE LEVEL CALCULATIONS

Construction Calculations

Phase: Demolition

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA) Lmax	Noise Level (dBA) Leq
Concrete Saw	1	90	20	50	0.5	90	83
Excavator	3	81	40	50	0.5	81	82
All Other Equipment > 5 HP	1	85	50	50	0.5	85	82
Dozer	2	82	40	50	0.5	82	81
					Combined at 50 feet	**92**	**88**
					Combined at Receptor 330 feet	**76**	**72**

Phase: Site Preparation

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA) Lmax	Noise Level (dBA) Leq
Tractor	4	84	40	50	0.5	84	86
All Other Equipment > 5 HP	1	85	50	50	0.5	85	82
Dozer	3	82	40	50	0.5	82	83
					Combined at 50 feet	**89**	**89**
					Combined at Receptor 330 feet	**72**	**72**
					Combined at Receptor 450 feet	**70**	**70**

Phase: Grading

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA) Lmax	Noise Level (dBA) Leq
Grader	1	85	40	50	0.5	85	81
Dozer	1	82	40	50	0.5	82	78
Tractor	3	84	40	50	0.5	84	85
Excavator	1	81	40	50	0.5	81	77
					Combined at 50 feet	**89**	**87**
					Combined at Receptor 330 feet	**73**	**71**
					Combined at Receptor 450 feet	**70**	**68**

Phase:Building Construction

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA) Lmax	Noise Level (dBA) Leq
Man Lift	3	75	20	50	0.5	75	73
Crane	1	81	16	50	0.5	81	73
Generator	1	81	50	50	0.5	81	78
Tractor	3	84	40	50	0.5	84	85
Welder / Torch	1	74	40	50	0.5	74	70
					Combined at 50 feet	**87**	**86**
					Combined at Receptor 330 feet	**71**	**70**

Phase: Paving

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA) Lmax	Noise Level (dBA) Leq
Paver	2	77	50	50	0.5	77	77
Roller	2	80	20	50	0.5	80	76
All Other Equipment > 5 HP	2	85	50	50	0.5	85	85
					Combined at 50 feet	**87**	**86**
					Combined at Receptor 330 feet	**70**	**70**

Phase:Architectural Coating

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA) Lmax	Noise Level (dBA) Leq
Compressor (air)	1	78	40	50	0.5	78	74
					Combined at 50 feet	**78**	**74**
					Combined at Receptor 330 feet	**62**	**58**

Sources: RCNM

[1]- Percentage of time that a piece of equipment is operating at full power.

dBA – A-weighted Decibels

Lmax- Maximum Level

Leq- Equivalent Level

Construction Traffic Noise Calculator

Construction Phase	One-Way Worker Trip/Day	One Way Vendor Trip/Day	One Way Hauling Trip Number	Total
Demolition	17.5	0	314	331.5
Site Preparation	20	0	0	20
Grading	15	0	269	284
Building Construction	82.1	15.5	0	97.6
Paving	15	0	0	15
Architectural Coating	16.4	0	0	16.4
Maximum				**284**

Phase Number	Phase Name	Number of Days
1	Demolition	30
2	Site Preparation	10
3	Grading	20
4	Building Construction	230
5	Paving	20
6	Architectural Coating	25

Roadway	Speed	Existing Volume	MT Factor	HT Factor
17th Street	45	24,010	12.6	38

Speed	MT Factor	HT Factor
25	16	83.3
30	15	65
35	14	53.3
40	13.2	45
45	12.6	38
50	12	33
55	11.5	29
60	11.1	26
65	10.8	23

	Worker Trip/Day	Vendor Trip/Day	Hauling Trip Number	Total	Overlap?
Demolition	**18**	**0**	**11,932**	11950	
Site Preparation	**20**	**0**	**0**	20	
Grading	**15**	**0**	**10,222**	10237	
Building Construction	**83**	**393**	**0**	476	
Paving	**15**	**0**	**0**	15	
Architectural Coating	**16**	**0**	**0**	17	

Overlap?	**N**
Total Equivalent Vehicles	**11,950**
Noise Increase (dBA)	**1.8**

APPENDIX C

FHWA TRAFFIC NOISE MODEL PRINTOUTS

TABLE Existing -01
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 05/14/2025
ROADWAY SEGMENT: 17th Street West of Prospect Avenue
NOTES: Cypress Grove Project - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 26920 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 25 SITE CHARACTERISTICS: HARD

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.13

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
63.0	184.7	579.2	1829.8

TABLE Existing -02
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 05/14/2025
ROADWAY SEGMENT: 17th Street East of Proposect Avenue
NOTES: Cypress Grove Project - Existing

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 24010 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 25 SITE CHARACTERISTICS: HARD

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 68.63

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
57.3	165.1	516.7	1632.0

TABLE Existing -03
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 05/14/2025
ROADWAY SEGMENT: Prospect Avenue North of 17th Street
NOTES: Cypress Grove Project - Existing

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 8980 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 20 SITE CHARACTERISTICS: HARD

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 64.60

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	64.3	194.2	611.2

TABLE Existing -04
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 05/14/2025
ROADWAY SEGMENT: Prospect Avenue between 17th Street and Vandenberg Lane
NOTES: Cypress Grove Project - Existing

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 9130 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 25 SITE CHARACTERISTICS: HARD

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 64.44

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	66.9	197.8	621.1

TABLE Existing -05
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 05/14/2025
ROADWAY SEGMENT: Prospect Avenue South of Vandenberg Lane
NOTES: Cypress Grove Project - Existing

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 10360 SPEED (MPH): 35 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 25 SITE CHARACTERISTICS: HARD

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 63.56

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	56.6	162.5	508.4

TABLE Existing -06
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 05/14/2025
ROADWAY SEGMENT: Vandenberg Lane West of Prospect Avenue
NOTES: Cypress Grove Project - Existing

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 1790 SPEED (MPH): 35 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 20 SITE CHARACTERISTICS: HARD

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 56.17

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	0.0	90.1

TABLE Existing With Project-01
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 05/14/2025
ROADWAY SEGMENT: 17th Street West of Prospect Avenue
NOTES: Cypress Grove Project - Existing With Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 27520 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 25 SITE CHARACTERISTICS: HARD

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.23

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
64.2	188.7	592.0	1870.5

TABLE Existing With Project-02
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 05/14/2025
ROADWAY SEGMENT: 17th Street East of Proposect Avenue
NOTES: Cypress Grove Project - Existing With Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 24260 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 25 SITE CHARACTERISTICS: HARD

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 68.68

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
57.8	166.8	522.0	1649.0

TABLE Existing With Project-03
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 05/14/2025
ROADWAY SEGMENT: Prospect Avenue North of 17th Street
NOTES: Cypress Grove Project - Existing With Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 9030 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 20 SITE CHARACTERISTICS: HARD

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 64.62

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	64.6	195.3	614.6

TABLE Existing With Project-04
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 05/14/2025
ROADWAY SEGMENT: Prospect Avenue between 17th Street and Vandenberg Lane
NOTES: Cypress Grove Project - Existing With Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 9980 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 25 SITE CHARACTERISTICS: HARD

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 64.82

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	72.3	216.0	678.8

TABLE Existing With Project-05
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 05/14/2025
ROADWAY SEGMENT: Prospect Avenue South of Vandenberg Lane
NOTES: Cypress Grove Project - Existing With Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 10490 SPEED (MPH): 35 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 25 SITE CHARACTERISTICS: HARD

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 63.62

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	57.2	164.5	514.8

TABLE Existing With Project-06
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 05/14/2025
ROADWAY SEGMENT: Vandenberg Lane West of Prospect Avenue
NOTES: Cypress Grove Project - Existing With Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 1840 SPEED (MPH): 35 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 20 SITE CHARACTERISTICS: HARD

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 56.29

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	0.0	92.5

TABLE Opening Year-01
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 05/14/2025
ROADWAY SEGMENT: 17th Street West of Prospect Avenue
NOTES: Cypress Grove Project - Opening Year

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 28510 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 25 SITE CHARACTERISTICS: HARD

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.38

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
66.2	195.4	613.3	1937.8

TABLE Opening Year-02
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 05/14/2025
ROADWAY SEGMENT: 17th Street East of Proposect Avenue
NOTES: Cypress Grove Project - Opening Year

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 25620 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 25 SITE CHARACTERISTICS: HARD

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 68.92

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
60.5	175.9	551.2	1741.4

TABLE Opening Year-03
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 05/14/2025
ROADWAY SEGMENT: Prospect Avenue North of 17th Street
NOTES: Cypress Grove Project - Opening Year

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 9780 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 20 SITE CHARACTERISTICS: HARD

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 64.97

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	69.5	211.3	665.5

TABLE Opening Year-04
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 05/14/2025
ROADWAY SEGMENT: Prospect Avenue between 17th Street and Vandenberg Lane
NOTES: Cypress Grove Project - Opening Year

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 10270 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 25 SITE CHARACTERISTICS: HARD

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 64.95

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	74.2	222.2	698.5

TABLE Opening Year-05
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 05/14/2025
ROADWAY SEGMENT: Prospect Avenue South of Vandenberg Lane
NOTES: Cypress Grove Project - Opening Year

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 11570 SPEED (MPH): 35 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 25 SITE CHARACTERISTICS: HARD

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 64.04

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	62.0	181.1	567.6

TABLE Opening Year-06
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 05/14/2025
ROADWAY SEGMENT: Vandenberg Lane West of Prospect Avenue
NOTES: Cypress Grove Project - Opening Year

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 1860 SPEED (MPH): 35 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 20 SITE CHARACTERISTICS: HARD

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 56.34

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	0.0	93.4

TABLE Opening Year With Project-01

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 05/14/2025
ROADWAY SEGMENT: 17th Street West of Prospect Avenue
NOTES: Cypress Grove Project - Opening Year With Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 27450 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 25 SITE CHARACTERISTICS: HARD

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.22

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
64.1	188.3	590.5	1865.8

TABLE Opening Year With Project-02

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 05/14/2025
ROADWAY SEGMENT: 17th Street East of Proposect Avenue
NOTES: Cypress Grove Project - Opening Year With Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 24640 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 25 SITE CHARACTERISTICS: HARD

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 68.75

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
58.6	169.3	530.2	1674.8

TABLE Opening Year With Project-03

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 05/14/2025
ROADWAY SEGMENT: Prospect Avenue North of 17th Street
NOTES: Cypress Grove Project - Opening Year With Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 9670 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 20 SITE CHARACTERISTICS: HARD

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 64.92

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	68.8	209.0	658.1

TABLE Opening Year With Project-04

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 05/14/2025
ROADWAY SEGMENT: Prospect Avenue between 17th Street and Vandenberg Lane
NOTES: Cypress Grove Project - Opening Year With Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 10000 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 25 SITE CHARACTERISTICS: HARD

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 64.83

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	72.4	216.4	680.2

TABLE Opening Year With Project-05

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 05/14/2025
ROADWAY SEGMENT: Prospect Avenue South of Vandenberg Lane
NOTES: Cypress Grove Project - Opening Year With Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 11390 SPEED (MPH): 35 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 25 SITE CHARACTERISTICS: HARD

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 63.98

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	61.2	178.3	558.8

TABLE Opening Year With Project-06

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 05/14/2025
ROADWAY SEGMENT: Vandenberg Lane West of Prospect Avenue
NOTES: Cypress Grove Project - Opening Year With Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 1770 SPEED (MPH): 35 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 20 SITE CHARACTERISTICS: HARD

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 56.12

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

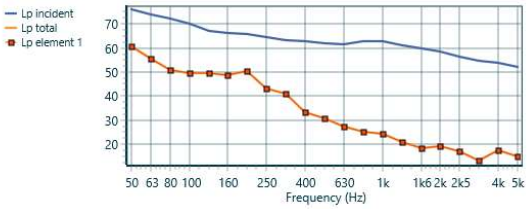
70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	0.0	89.1

APPENDIX D

INSUL INTERIOR MODEL PRINTOUTS

Outdoor To Indoor Sound Transmission (v10.0.6)

Program copyright Marshall Day Acoustics
Margin of error is generally within ±3 dB
- Key No. 4862
Job Name:
Job No.: Initials:JStephens
Date:7/22/2025
File Name:1 Flex.inz



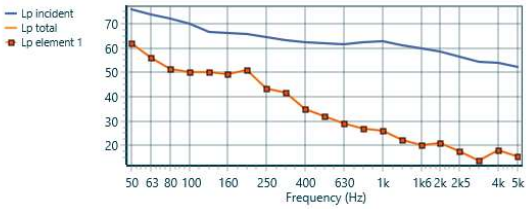
Octave Band Centre Frequency (Hz)																					
Source	63		125		250		500		1k		2k		4k								Overall dBA
Incident sound level (freefield)	76.0	74.0	72.3	69.9	66.9	66.2	65.7	64.4	63.4	62.6	62.0	61.7	62.6	62.8	61.2	59.8	58.6	56.5	54.6	53.8	52.3	71.0
Path																						
Element 1 , STL	-17	-20	-23	-22	-19	-19	-17	-23	-24	-31	-33	-36	-39	-40	-42	-43	-41	-41	-43	-38	-39	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Area (+10LogA), 108 ft²	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	
Element sound level contribution	61	56	51	50	50	49	50	43	41	33	31	27	25	25	21	19	19	17	13	18	15	44.3
Receiver																						
Room volume (-10LogV), 1475.00 ft³	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	
Reverberation time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
RT (+10LogT)	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	
Equation Constant	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	
Room sound level	61	56	51	50	50	49	50	43	41	33	31	27	25	25	21	19	19	17	13	18	15	44.3
Level difference																						LpAinc - LpARev,T0
D2m,nT	18.4	21.4	24.4	23.4	20.4	20.4	18.4	24.4	25.4	32.4	34.4	37.4	40.4	41.4	43.4	44.4	42.4	42.4	44.4	39.4	40.4	26.7

** Element descriptions:

#1:
Wall (Double):
- Panel 1: 1 x 0.5 in Stucco + 1 x 0.626 in Type X Gypsum Board
- Frame: Timber stud (3.7 in x 1.85 in), Stud spacing 16 in , Cavity Width 3.7 in + 3 in fiberglass (0.6 lb/ft3)
- Panel 2: 1 x 0.626 in Type X Gypsum Board
- Details: Panel Size 8.9 ft x 13.1 ft, Partition surface mass = 9.27 lb/ft², Mass-air-mass resonant frequency = 66 Hz

Outdoor To Indoor Sound Transmission (v10.0.6)

Program copyright Marshall Day Acoustics
Margin of error is generally within ±3 dB
- Key No. 4862
Job Name:
Job No.: Initials:JStephens
Date:7/22/2025
File Name:1 Great.inz



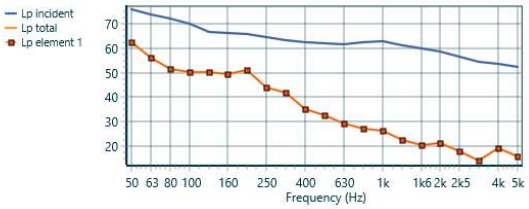
Octave Band Centre Frequency (Hz)																					
Source	63		125		250		500		1k		2k		4k								Overall dBA
Incident sound level (freefield)	76.0	74.0	72.3	69.9	66.9	66.2	65.7	64.4	63.4	62.6	62.0	61.7	62.6	62.8	61.2	59.8	58.6	56.5	54.6	53.8	52.3	71.0
Path																					
Element 1 , STL	-16	-20	-23	-22	-19	-19	-17	-23	-24	-30	-32	-35	-38	-39	-41	-42	-40	-41	-43	-38	-39	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Area (+10LogA), 150 ft²	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	
Element sound level contribution	62	56	51	50	50	49	51	44	42	35	32	29	27	26	22	20	21	18	14	18	15	45.0
Receiver																						
Room volume (-10LogV), 1838.00 ft³	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	
Reverberation time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
RT (+10LogT)	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	
Equation Constant	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	
Room sound level	62	56	51	50	50	49	51	44	42	35	32	29	27	26	22	20	21	18	14	18	15	45.0
Level difference																						LpAinc - LpARev,T0
D2m,nT	17.0	21.0	24.0	23.0	20.0	20.0	18.0	24.0	25.0	31.0	33.0	36.0	39.0	40.0	42.0	43.0	41.0	42.0	44.0	39.0	40.0	26.1

** Element descriptions:

#1:
Wall (Double):
- Panel 1: 1 x 0.5 in Stucco + 1 x 0.626 in Type X Gypsum Board
- Frame: Timber stud (3.7 in x 1.85 in), Stud spacing 16 in , Cavity Width 3.7 in + 3 in fiberglass (0.6 lb/ft3)
- Panel 2: 1 x 0.626 in Type X Gypsum Board
- Details: Panel Size 8.9 ft x 13.1 ft, Partition surface mass = 9.27 lb/ft², Mass-air-mass resonant frequency = 66 Hz

Outdoor To Indoor Sound Transmission (v10.0.6)

Program copyright Marshall Day Acoustics
Margin of error is generally within ±3 dB
- Key No. 4862
Job Name:
Job No.: Initials:JStephens
Date:7/22/2025
File Name:1 Primary.inz



Source	63		125		250		500		1k		2k		4k		Overall dBA
Incident sound level (freefield)	76.0	74.0	72.3	69.9	66.9	66.2	65.7	64.4	63.4	62.6	62.0	61.7	62.6	62.8	71.0
Path															
Element 1 , STL	-16	-20	-23	-22	-19	-19	-17	-23	-24	-30	-32	-35	-38	-39	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Area (+10LogA), 110 ft²	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	
Element sound level contribution	62	56	52	50	50	49	51	44	42	35	32	29	27	26	45.0
Receiver															
Room volume (-10LogV), 1323.00 ft³	-20.2	-20.2	-20.2	-20.2	-20.2	-20.2	-20.2	-20.2	-20.2	-20.2	-20.2	-20.2	-20.2	-20.2	
Reverberation time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
RT (+10LogT)	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	
Equation Constant	16	16	16	16	16	16	16	16	16	16	16	16	16	16	
Room sound level	62	56	52	50	50	49	51	44	42	35	32	29	27	26	45.0
Level difference															LpAinc - LpARev,T0
D2m,nT	16.9	20.9	23.9	22.9	19.9	19.9	17.9	23.9	24.9	30.9	32.9	35.9	38.9	39.9	26.0

Source	2k		4k		Overall dBA
Incident sound level (freefield)	59.8	58.6	56.5	54.6	53.8	52.3	71.0
Path							
Element 1 , STL	-42	-40	-41	-43	-37	-39	
Facade Shape factor Level diff.	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	
Area (+10LogA), 110 ft²	20.4	20.4	20.4	20.4	20.4	20.4	
Element sound level contribution	20	21	18	14	19	16	45.0
Receiver							
Room volume (-10LogV), 1323.00 ft³	-20.2	-20.2	-20.2	-20.2	-20.2	-20.2	
Reverberation time (s)	0.5	0.5	0.5	0.5	0.5	0.5	
RT (+10LogT)	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	
Equation Constant	16	16	16	16	16	16	
Room sound level	20	21	18	14	19	16	45.0
Level difference							LpAinc - LpARev,T0
D2m,nT	42.9	40.9	41.9	43.9	37.9	39.9	26.0

** Element descriptions:

#1:
Wall (Double):
- Panel 1: 1 x 0.5 in Stucco + 1 x 0.626 in Type X Gypsum Board
- Frame: Timber stud (3.7 in x 1.85 in), Stud spacing 16 in , Cavity Width 3.7 in + 3 in fiberglass (0.6 lb/ft3)
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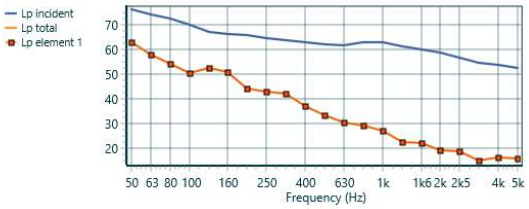
- Details: Panel Size 8.9 ft x 13.1 ft, Partition surface mass = 9.27 lb/ft², Mass-air-mass resonant frequency = 66 Hz

Outdoor To Indoor Sound Transmission (v10.0.6)

Program copyright Marshall Day Acoustics
Margin of error is generally within ±3 dB
- Key No. 4862
Job Name:
Job No.: Initials:JStephens
Date:7/22/2025
File Name:2 Great.inz



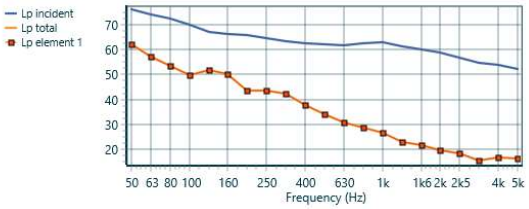
Octave Band Centre Frequency (Hz)																					
Source	63		125		250		500		1k		2k		4k								Overall dBA
Incident sound level (freefield)	76.0	74.0	72.3	69.9	66.9	66.2	65.7	64.4	63.4	62.6	62.0	61.7	62.6	62.8	61.2	59.8	58.6	56.5	54.6	53.8	52.3	71.0
Path																						
Element 1 , STL	-18	-21	-23	-24	-19	-20	-26	-26	-26	-30	-33	-36	-38	-40	-43	-42	-44	-42	-44	-42	-41	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Area (+10LogA), 261 ft²	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	
Element sound level contribution	63	58	54	51	53	51	44	43	42	37	34	30	29	27	23	22	19	19	15	16	16	44.7
Receiver																						
Room volume (-10LogV), 1838.00 ft³	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	
Reverberation time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
RT (+10LogT)	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	
Equation Constant	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	
Room sound level	63	58	54	51	53	51	44	43	42	37	34	30	29	27	23	22	19	19	15	16	16	44.7
Level difference																						LpAinc - LpARev,T0
D2m,nT	16.5	19.5	21.5	22.5	17.5	18.5	24.5	24.5	24.5	28.5	31.5	34.5	36.5	38.5	41.5	40.5	42.5	40.5	42.5	40.5	39.5	26.3

** Element descriptions:

#1:
Wall (Double):
- Panel 1: 1 x 0.5 in Stucco + 1 x 0.626 in Type X Gypsum Board
- Frame: Timber stud (3.7 in x 1.85 in), Stud spacing 16 in , Cavity Width 3.7 in + 3 in fiberglass (0.6 lb/ft3)
- Panel 2: 1 x 0.626 in Type X Gypsum Board
- Details: Panel Size 8.9 ft x 13.1 ft, Partition surface mass = 9.27 lb/ft², Mass-air-mass resonant frequency = 66 Hz

Outdoor To Indoor Sound Transmission (v10.0.6)

Program copyright Marshall Day Acoustics
Margin of error is generally within ±3 dB
- Key No. 4862
Job Name:
Job No.: <ProgramData> Initials:
Date:7/22/2025
File Name:2 Primary.inz



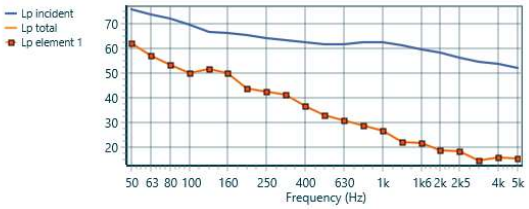
Octave Band Centre Frequency (Hz)																					
Source	63		125		250		500		1k		2k		4k								Overall dBA
Incident sound level (freefield)	76.0	74.0	72.3	69.9	66.9	66.2	65.7	64.4	63.4	62.6	62.0	61.7	62.6	62.8	61.2	59.8	58.6	56.5	54.6	53.8	52.3	71.0
Path																					
Element 1 , STL	-18	-21	-23	-24	-19	-20	-26	-25	-25	-29	-32	-35	-38	-40	-42	-42	-43	-42	-43	-41	-40	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Area (+10LogA), 237 ft²	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	
Element sound level contribution	62	57	53	50	52	50	44	43	42	38	34	31	29	27	23	22	20	18	16	17	16	44.5
Receiver																						
Room volume (-10LogV), 1544.00 ft³	-20.9	-20.9	-20.9	-20.9	-20.9	-20.9	-20.9	-20.9	-20.9	-20.9	-20.9	-20.9	-20.9	-20.9	-20.9	-20.9	-20.9	-20.9	-20.9	-20.9	-20.9	
Reverberation time (s)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
RT (+10LogT)	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	
Equation Constant	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	
Room sound level	62	57	53	50	52	50	44	43	42	38	34	31	29	27	23	22	20	18	16	17	16	44.5
Level difference																						LpAinc - LpARev,T0
D2m,nT	16.2	19.2	21.2	22.2	17.2	18.2	24.2	23.2	23.2	27.2	30.2	33.2	36.2	38.2	40.2	40.2	41.2	40.2	41.2	39.2	38.2	25.6

** Element descriptions:

#1:
Wall (Double):
- Panel 1: 1 x 0.5 in Stucco + 1 x 0.626 in Type X Gypsum Board
- Frame: Timber stud (3.7 in x 1.85 in), Stud spacing 16 in , Cavity Width 3.7 in + 3 in fiberglass (0.6 lb/ft3)
- Panel 2: 1 x 0.626 in Type X Gypsum Board
- Details: Panel Size 8.9 ft x 13.1 ft, Partition surface mass = 9.27 lb/ft², Mass-air-mass resonant frequency = 66 Hz

Outdoor To Indoor Sound Transmission (v10.0.6)

Program copyright Marshall Day Acoustics
Margin of error is generally within ±3 dB
- Key No. 4862
Job Name:
Job No.: <ProgramData> Initials:
Date:7/22/2025
File Name:3 Bed 4.inz



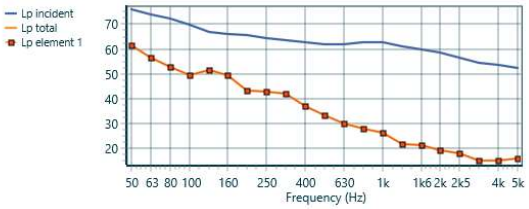
Octave Band Centre Frequency (Hz)																					
Source	63		125		250		500		1k		2k		4k								Overall dBA
Incident sound level (freefield)	76.0	74.0	72.3	69.9	66.9	66.2	65.7	64.4	63.4	62.6	62.0	61.7	62.6	62.8	61.2	59.8	58.6	56.5	54.6	53.8	52.3	71.0
Path																						
Element 1 , STL	-18	-21	-23	-24	-19	-20	-26	-26	-26	-30	-33	-35	-38	-40	-43	-42	-44	-42	-44	-42	-41	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Area (+10LogA), 230 ft²	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	
Element sound level contribution	62	57	53	50	52	50	44	42	41	37	33	31	29	27	22	22	19	19	15	16	15	44.2
Receiver																						
Room volume (-10LogV), 1460.00 ft³	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	
Reverberation time (s)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
RT (+10LogT)	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	
Equation Constant	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	
Room sound level	62	57	53	50	52	50	44	42	41	37	33	31	29	27	22	22	19	19	15	16	15	44.2
Level difference																						LpAinc - LpARev,T0
D2m,nT	16.1	19.1	21.1	22.1	17.1	18.1	24.1	24.1	24.1	28.1	31.1	33.1	36.1	38.1	41.1	40.1	42.1	40.1	42.1	40.1	39.1	25.8

** Element descriptions:

#1:
Wall (Double):
- Panel 1: 1 x 0.5 in Stucco + 1 x 0.626 in Type X Gypsum Board
- Frame: Timber stud (3.7 in x 1.85 in), Stud spacing 16 in , Cavity Width 3.7 in + 3 in fiberglass (0.6 lb/ft3)
- Panel 2: 1 x 0.626 in Type X Gypsum Board
- Details: Panel Size 8.9 ft x 13.1 ft, Partition surface mass = 9.27 lb/ft², Mass-air-mass resonant frequency = 66 Hz

Outdoor To Indoor Sound Transmission (v10.0.6)

Program copyright Marshall Day Acoustics
Margin of error is generally within ±3 dB
- Key No. 4862
Job Name:
Job No.: <ProgramData> Initials:
Date:7/22/2025
File Name:3 Great.inz



Source	63	125	250	500	1k	2k	4k	Overall dBA
	Octave Band Centre Frequency (Hz)							
Incident sound level (freefield)	76.0 74.0 72.3	69.9 66.9 66.2	65.7 64.4 63.4	62.6 62.0 61.7	62.6 62.8 61.2	59.8 58.6 56.5	54.6 53.8 52.3	71.0
Path								
Element 1 , STL	-18 -21 -23	-24 -19 -20	-26 -25 -25	-29 -32 -35	-38 -40 -43	-42 -43 -42	-43 -42 -40	
Facade Shape factor Level diff.	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	
Insertion Loss	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	
Area (+10LogA), 270 ft²	24.3 24.3 24.3	24.3 24.3 24.3	24.3 24.3 24.3	24.3 24.3 24.3	24.3 24.3 24.3	24.3 24.3 24.3	24.3 24.3 24.3	
Element sound level contribution	61 56 53	49 51 50	43 43 42	37 33 30	28 26 22	21 19 18	15 15 16	43.9
Receiver								
Room volume (-10LogV), 1988.00 ft³	- - -	- - -	- - -	- - -	- - -	- - -	- - -	
Reverberation time (s)	22.0 22.0 22.0 0.4 0.4 0.4	22.0 22.0 22.0 0.4 0.4 0.4	22.0 22.0 22.0 0.4 0.4 0.4	22.0 22.0 22.0 0.4 0.4 0.4	22.0 22.0 22.0 0.4 0.4 0.4	22.0 22.0 22.0 0.4 0.4 0.4	22.0 22.0 22.0 0.4 0.4 0.4	
RT (+10LogT)	-4.0 -4.0 -4.0	-4.0 -4.0 -4.0	-4.0 -4.0 -4.0	-4.0 -4.0 -4.0	-4.0 -4.0 -4.0	-4.0 -4.0 -4.0	-4.0 -4.0 -4.0	
Equation Constant	16 16 16	16 16 16	16 16 16	16 16 16	16 16 16	16 16 16	16 16 16	
Room sound level	61 56 53	49 51 50	43 43 42	37 33 30	28 26 22	21 19 18	15 15 16	43.9
Level difference								LpAinc - LpARev,T0
D2m,nT	16.7 19.7 21.7	22.7 17.7 18.7	24.7 23.7 23.7	27.7 30.7 33.7	36.7 38.7 41.7	40.7 41.7 40.7	41.7 40.7 38.7	26.1

** Element descriptions:

#1:
Wall (Double):
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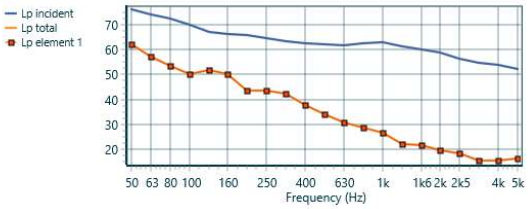
- Details: Panel Size 8.9 ft x 13.1 ft, Partition surface mass = 9.27 lb/ft², Mass-air-mass resonant frequency = 66 Hz

Outdoor To Indoor Sound Transmission (v10.0.6)

Program copyright Marshall Day Acoustics
Margin of error is generally within ±3 dB
- Key No. 4862
Job Name:
Job No.: <ProgramData> Initials:
Date:7/22/2025
File Name:3 Primary.inz



Octave Band Centre Frequency (Hz)																					
Source	63		125		250		500		1k		2k		4k								Overall dBA
Incident sound level (freefield)	76.0	74.0	72.3	69.9	66.9	66.2	65.7	64.4	63.4	62.6	62.0	61.7	62.6	62.8	61.2	59.8	58.6	56.5	54.6	53.8	52.3	71.0
Path																					
Element 1 , STL	-18	-21	-23	-24	-19	-20	-26	-25	-25	-29	-32	-35	-38	-40	-43	-42	-43	-42	-43	-42	-40	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Area (+10LogA), 230 ft²	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	
Element sound level contribution	62	57	53	50	52	50	44	43	42	38	34	31	29	27	22	22	20	19	16	16	16	44.6
Receiver																						
Room volume (-10LogV), 1460.00 ft³	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	-20.6	
Reverberation time (s)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
RT (+10LogT)	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	
Equation Constant	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	
Room sound level	62	57	53	50	52	50	44	43	42	38	34	31	29	27	22	22	20	19	16	16	16	44.6
Level difference																						LpAinc - LpARev,T0
D2m,nT	16.1	19.1	21.1	22.1	17.1	18.1	24.1	23.1	23.1	27.1	30.1	33.1	36.1	38.1	41.1	40.1	41.1	40.1	41.1	40.1	38.1	25.5

** Element descriptions:

#1:
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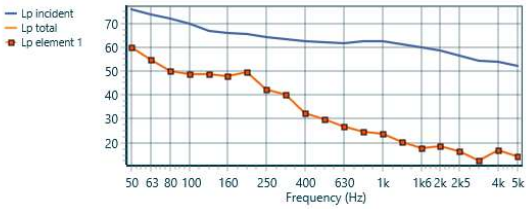
- Details: Panel Size 8.9 ft x 13.1 ft, Partition surface mass = 9.27 lb/ft², Mass-air-mass resonant frequency = 66 Hz

Outdoor To Indoor Sound Transmission (v10.0.6)

Program copyright Marshall Day Acoustics
Margin of error is generally within ±3 dB
- Key No. 4862
Job Name:
Job No.: Initials:JStephens
Date:7/22/2025
File Name:1~2~3 Bed 23.inz



Source	63	125	250	500	1k	2k	4k	Overall dBA
	Octave Band Centre Frequency (Hz)							
Incident sound level (freefield)	76.0 74.0 72.3	69.9 66.9 66.2	65.7 64.4 63.4	62.6 62.0 61.7	62.6 62.8 61.2	59.8 58.6 56.5	54.6 53.8 52.3	71.0
Path								
Element 1 , STL	-17 -20 -23	-22 -19 -19	-17 -23 -24	-31 -33 -36	-39 -40 -42	-43 -41 -41	-43 -38 -39	
Facade Shape factor Level diff.	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	
Insertion Loss	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	
Area (+10LogA), 90 ft²	19.5 19.5 19.5	19.5 19.5 19.5	19.5 19.5 19.5	19.5 19.5 19.5	19.5 19.5 19.5	19.5 19.5 19.5	19.5 19.5 19.5	
Element sound level contribution	60 55 50	49 49 48	50 42 40	32 30 27	24 24 20	18 18 16	12 17 14	43.5
Receiver								
Room volume (-10LogV), 900.00 ft³	18.5 18.5 18.5	18.5 18.5 18.5	18.5 18.5 18.5	18.5 18.5 18.5	18.5 18.5 18.5	18.5 18.5 18.5	18.5 18.5 18.5	
Reverberation time (s)	0.3 0.3 0.3	0.3 0.3 0.3	0.3 0.3 0.3	0.3 0.3 0.3	0.3 0.3 0.3	0.3 0.3 0.3	0.3 0.3 0.3	
RT (+10LogT)	-5.2 -5.2 -5.2	-5.2 -5.2 -5.2	-5.2 -5.2 -5.2	-5.2 -5.2 -5.2	-5.2 -5.2 -5.2	-5.2 -5.2 -5.2	-5.2 -5.2 -5.2	
Equation Constant	16 16 16	16 16 16	16 16 16	16 16 16	16 16 16	16 16 16	16 16 16	
Room sound level	60 55 50	49 49 48	50 42 40	32 30 27	24 24 20	18 18 16	12 17 14	43.5
Level difference								LpAinc - LpARev,T0
D2m,nT	17.1 20.1 23.1	22.1 19.1 19.1	17.1 23.1 24.1	31.1 33.1 36.1	39.1 40.1 42.1	43.1 41.1 41.1	43.1 38.1 39.1	25.3

** Element descriptions:

#1:
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